

New York State Museum Bulletin

Published by The University of the State of New York

No. 273

ALBANY, N. Y.

February 1927

New York, State Museum, *Albany*

CHARLES C. ADAMS, DIRECTOR

THE MINING AND QUARRY INDUSTRIES OF NEW YORK FROM 1919 TO 1924 INCLUDING LISTS OF OPERATORS

By

C. A. HARTNAGEL

Assistant State Geologist

TABLE OF CONTENTS

	PAGE		PAGE
Introduction	5	Mineral paint	57
Carbon dioxide	16	Mineral waters	58
Cement	16	Natural gas	61
Clay materials	18	Natural gas gasoline.....	63
Crude clay	32	Peat	65
Diatomaceous earth	33	Petroleum	67
Emery	34	Pyrite	70
Feldspar	36	Quartz	72
Fuller's earth	38	Salt	72
Garnet	39	Sand and gravel.....	77
Graphite	42	Sand-lime brick	79
Gypsum	44	Slate	80
Iron ore	47	Stone	82
Lead	51	(granite, limestone, marble, sandstone, trap)	
Lime	86	Talc	94
Marl	52	Zinc	97
Mica	54	Index	101
Millstones	55		

ALBANY

THE UNIVERSITY OF THE STATE OF NEW YORK
1927

THE UNIVERSITY OF THE STATE OF NEW YORK

Regents of the University
With years when terms expire

1934	CHESTER S. LORD	M.A., LL.D.,	<i>Chancellor</i>	- -	Brooklyn
1936	ADELBERT MOOT	LL.D.,	<i>Vice Chancellor</i>	- -	Buffalo
1927	ALBERT VANDER VEER	M.D., M.A., Ph.D., LL.D.			Albany
1928	WALTER GUEST KELLOGG	B.A., LL.D.	- - -		Ogdensburg
1932	JAMES BYRNE	B.A., LL.B., LL.D.	- - - -		New York
1931	THOMAS J. MANGAN	M.A., LL.D.	- - - - -		Binghamton
1933	WILLIAM J. WALLIN	M.A.	- - - - -		Yonkers
1935	WILLIAM BONDY	M.A., LL.B., Ph.D., D.C.L.	-		New York
1930	WILLIAM P. BAKER	B.L., Litt. D.	- - - -		Syracuse
1929	ROBERT W. HIGBIE	M.A.	- - - - -		Jamaica
1938	ROLAND B. WOODWARD	B.A.	- - - - -		Rochester

President of the University and Commissioner of Education
FRANK P. GRAVES Ph.D., Litt. D., L.H.D., LL.D.

Deputy Commissioner
AUGUSTUS S. DOWNING M.A., Pd.D., L.H.D., LL.D.

Counsel
ERNEST E. COLE LL.B.

Assistant Commissioner for Higher and Professional Education
JAMES SULLIVAN M.A., Ph.D.

Assistant Commissioner for Secondary Education
GEORGE M. WILEY M.A., Pd.D., LL.D.

Assistant Commissioner for Elementary Education
J. CAYCE MORRISON M.A., Ph.D.

Director of State Library
JAMES I. WYER M.L.S., Pd.D.

Director of Science and State Museum
CHARLES C. ADAMS M.S., Ph.D., D.Sc.

Directors of Divisions

Administration, LLOYD L. CHENEY, B.A.
Archives and History, ALEXANDER C. FLICK, M.A., Litt. D., Ph.D.
Attendance,
Examinations and Inspections, AVERY W. SKINNER B.A., Pd.D.
Finance, CLARK W. HALLIDAY
Law, IRWIN ESMOND Ph.B., LL.B.
Library Extension, FRANK L. TOLMAN Ph.B.
School Buildings and Grounds, FRANK H. WOOD M.A.
Visual Instruction, ALFRED W. ABRAMS Ph.B.
Vocational and Extension Education, LEWIS A. WILSON D.Sc.

STATE MUSEUM STAFF

Charles C. Adams Ph.D., D.Sc.....	<i>Director of the Museum</i>
Jacob Van Deloo.....	<i>Secretary of the Museum</i>
Rudolf Ruedemann Ph.D.....	<i>State Paleontologist</i>
Ephraim P. Felt D.Sc.....	<i>State Entomologist</i>
Homer D. House Ph.D.....	<i>State Botanist</i>
Chris A. Hartnagel M.A.....	<i>Assistant State Geologist</i>
Sherman C. Bishop Ph.D.....	<i>Zoologist</i>
Winifred Goldring M.A.....	<i>Paleobotanist</i>
Noah T. Clarke.....	<i>Archeologist</i>
Neil Hotchkiss M.A.....	<i>Technical Assistant</i>
Kenyon F. Chamberlain.....	<i>Technical Assistant</i>
Walter J. Schoonmaker.....	<i>Technical Assistant</i>
Clinton F. Kilfoyle.....	<i>Technical Assistant</i>
Arthur Paladin.....	<i>Technical Assistant</i>
Edwin J. Stein.....	<i>Technical Assistant</i>
John L. Casey.....	<i>Custodian</i>

Honorary Curators

William L. Bryant.....	<i>Honorary Curator of Fossil Fishes</i>
Benjamin W. Arnold.....	<i>Honorary Curator of Ornithology</i>
Harry S. Peck.....	<i>Honorary Curator of Minerals</i>

Temporary Appointments*

Francis Harper Ph.D.....	<i>Assistant Zoologist</i>
Clair A. Brown B.S.....	<i>Assistant Botanist</i>
Robert Balk Ph.D.....	<i>Assistant Geologist</i>
R. J. Colony B.Ch.....	<i>Assistant Geologist</i>
Nelson T. Dale Ph.D.....	<i>Assistant Geologist</i>
A. K. Lobeck Ph.D.....	<i>Assistant Geologist</i>
Burnett Smith Ph.D.....	<i>Assistant Geologist</i>
George H. Chadwick M.S.....	<i>Assistant Geologist</i>
D. H. Newland B.A.....	<i>Assistant Geologist</i>

*During the fiscal year 1926-27.

New York State Museum Bulletin

Published by The University of the State of New York

No. 273

ALBANY, N. Y.

February 1927

New York State Museum

CHARLES C. ADAMS, DIRECTOR

THE MINING AND QUARRY INDUSTRIES OF NEW YORK FROM 1919 TO 1924

By

C. A. HARTNAGEL

Assistant State Geologist

INTRODUCTION

In this bulletin is contained an account of the useful mineral deposits of the State of New York, their locations, their character and tables of production with lists of mine and quarry operators. It supplements the earlier report on The Mineral Resources of the State of New York by D. H. Newland, also published by the State Museum (Bul. 223-24, 1921, p. 1-315).

The mineral production of New York State in 1924 amounted to \$96,395,492, the largest value ever recorded. This is an increase of more than six million dollars over the value reported for 1923 and twenty-three million above the 1922 production.

In the table showing the mineral production since 1904, it will be seen that the value of mineral production in the State has increased from \$28,812,595 in 1904 to considerably more than three times that amount in 1924, and that the total value of mineral products from 1904-24 exceeds one billion dollars. The increased values for the last few years are, of course, in part due to higher prices for most quarry materials. Many minerals, however, have been produced in larger amounts than ever before, and in order that a comparison may be had between quantities and values, the following comparative statements are of interest.

Cement

In 1924 the output of portland cement amounted to 7,435,875 barrels valued at \$13,460,594. In 1923 the output was 6,853,062 barrels with a value of \$12,834,471. The enormous growth of the portland cement industry is shown by the fact that in 1912 the output amounted to but 4,495,842 barrels. In 1902 the production was slightly more than 1,000,000 barrels, and in 1890 but 65,000 barrels. Natural cement, on the other hand, has shown a steady decline from a maximum production of over 4,000,000 barrels in 1899 until at present the production amounts to but a few thousand barrels. A natural cement plant now under construction in Erie County will no doubt, materially increase the annual output of natural cement.

Clay Products

The total number of common building brick produced in 1924 amounted to 1,029,667,000 valued at \$13,683,606. These totals represent a slight increase in quantity, but a decrease in value over those for 1923. The year 1924 is the first since 1913 when a production of more than 1,000,000,000 brick was recorded. As an industry brickmaking has shown a slight decrease during the past 20 years despite the fact that in point of value its annual total has nearly doubled since 1904.

For other clay wares exclusive of pottery, such as terra cotta, tile and sewer pipe, the value in 1924 amounted to \$3,678,564, as against a value of \$4,468,045 in the previous year. This indicates a decided loss in output, but as the quantities of the various materials are measured in different units, these can not be stated without considerable detail.

The value of pottery in 1924 was \$8,421,523, an increase of more than \$2,000,000 over the preceding year. Twenty years ago the pottery output amounted to about one and one-half million dollars.

Garnet

The production of garnet has shown a substantial increase during the past 20 years. The 1924 production was 7428 tons with a value of \$623,472. The highest production ever made was in 1923 when 7662 tons were produced with a value of \$583,190.

Gypsum

There has been a remarkable growth of the gypsum industry in recent years. In 1924 the number of tons mined amounted to 1,474,491 with a value of \$14,329,246. In 1923 the mine output

amounted to 1,361,116 tons valued at \$10,344,745. In 1904 the mine production was but 151,455 tons valued at \$424,975.

Iron Ore

Depression in the iron ore industry has been most marked during the past three or four years and several of the largest producing mines have been closed at various times. The data given represent shipments rather than actual amount of ore mined, as considerable stocks were held over from year to year. Shipments in 1924 were reported as 316,352 long tons; in 1923, 734,945 long tons; in 1922, 205,964 long tons; in 1921, 176,813 long tons; in 1920, 972,909 long tons.

Mineral Waters

The production of mineral waters during the past three years has amounted to more than six and one-half million gallons annually with a value of a little more than \$800,000 yearly. The industry has actually registered a loss over a period of years.

Natural Gas

The production of natural gas in New York reached its peak in the year 1914 after having shown a steady annual increase for 18 years, 1897-1914. Since then production has gradually decreased from 8,714,681 M cubic feet in 1914 to 6,196,000 M cubic feet in 1924. In all probability additional supplies will become available as more extensive drilling is carried on, and no doubt some new pools will be found. Only by finding new supplies can production be maintained at anywhere near the present volume.

Petroleum

In view of the fact that there have been no new oil pools or new producing oil sands discovered in the State in recent years, the 1924 production of petroleum amounting to 1,400,000 barrels, the largest in 33 years or since 1891, is very encouraging. The 1924 output was nearly double that of 1912 and the increase in the number of barrels produced annually during recent years is due largely to the use of "flooding" methods whereby additional recovery of petroleum is obtained from the old oil pools.

Salt

The salt production in 1924 amounted to 14,091,486 barrels, a decrease from 1923 when the production amounted to 14,756,014 barrels. The production of salt during the past 20 years, has, however, shown a steady growth, and the present annual output is more

than 5,000,000 barrels over the 1904 production. The total recorded production of salt in the State since the establishment of the industry is more than 400,000,000 barrels.

Sand and Gravel

The production of sand and gravel has shown a good increase in recent years and in 1924 amounted to 13,397,540 tons with a value of \$8,583,193. In 1923 the corresponding totals were 10,730,225 tons with a value \$7,291,076. Molding sand production, included in the above, amounted to 607,089 tons in 1924 and was valued at \$1,040,735.

Slate

The large growth in the value and quantity of slate reported during recent years is due to the manufacture of slate granules for roofing which was started in 1917. In 1916 the production of slate was the smallest in many years and amounted to but \$21,345. The 1924 production amounted to \$962,276, of which granules alone are credited with a value of more than \$700,000. Roofing slate in 1924 amounted to nearly 11,000 squares, which was the largest production since 1911.

Stone

The total value of the quarry products of granite, limestone, marble, sandstone and trap, but exclusive of value of limestone used in cement making, amounted to \$11,973,613 in 1924 as against \$10,648,061 in 1923. The value of limestone alone for 1924 was more than \$9,000,000 and its production has shown a steady increase during the past 20 years. The value of the other kinds of stone have remained nearly stationary and for most of them there has been an actual reduction in the quantity quarried. The large decrease in the value of trap is due largely to the closing of quarries along the palisades of the Hudson, when the quarry sites were taken over by the State for park purposes.

Talc

The output of talc in 1924 amounted to 78,340 tons valued at \$1,162,488. In 1923 the talc produced amounted to 71,304 tons with a value of \$1,079,322. The average annual production for the past 21 years has been something over 66,000 tons.

Zinc

The mining of zinc ore in New York State started in 1915, since which time 446,550 short tons of zinc ore with a value of \$7,677,287 have been produced. The 1924 output amounted to 40,350 tons with a value of \$606,320.

Other Materials

Among the miscellaneous minerals produced in the State during 1924 are the following: crude clay, 5948 tons, value \$31,238; diatomaceous earth, 199 tons, value \$12,995; emery, 1610 tons, value \$11,426; feldspar and quartz, 17,686 tons, value \$120,739; millstones valued at \$18,215; gasoline recovered from natural gas, 476,753 gallons, value \$49,639; peat, 508 tons, value \$7438; pyrite, 7593 long tons, value \$16,705; sand-lime brick, 16,529 M, value \$220,851. The combined 1924 values of carbon dioxide (carbonic acid gas), natural cement and marl amounted to \$45,872.

Grateful acknowledgement is hereby expressed on the part of the State Museum to the more than 1200 mineral producers of the State, who by their cordial cooperation have made the statistics presented here and in the following chapters possible. Acknowledgment is also due to the United States Geological Survey and to the Bureau of the Census for their cooperation in gathering statistics, the latter having aided materially with the work on the clay products industry.

Annual mineral production in New York since 1904

YEAR	VALUE
1904	\$28 812 595
1905	35 470 987
1906	37 132 832
1907	37 141 006
1908	29 519 785
1909	34 742 287
1910	35 400 257
1911	31 730 747
1912	36 552 784
1913	41 598 399
1914	35 870 004
1915	35 988 407
1916	45 947 947
1917	52 191 692
1918	54 169 287
1919	56 415 992
1920	78 517 407
1921	62 558 713
1922	73 644 343
1923	90 617 718
1924	96 395 492
Total value	\$1 030 418 681

Mineral production in New York in 1919

PRODUCT	UNIT OF MEASUREMENT	QUANTITY	VALUE
Portland cement.....	Barrels.....	4 441 250	\$7 700 406
Building brick.....	Thousands.....	482 114	6 423 436
Pottery.....	.....	.....	5 633 355
Other clay products.....	.....	.....	2 411 795
Diatomaceous earth.....	Short tons.....	.....	<i>a</i>
Crude clay.....	Short tons.....	.....	<i>a</i>
Emery.....	Short tons.....	1 563	13 459
Feldspar and quartz.....	Short tons.....	10 412	84 901
Garnet.....	Short tons.....	4 623	301 252
Graphite.....	Pounds.....	.....	<i>a</i>
Gypsum.....	Short tons.....	591 153	3 530 743
Iron ore.....	Long tons.....	701 688	4 002 312
Millstones.....	.....	.....	10 155
Metallic paint (iron ore).....	Short tons.....	9 675	<i>a</i>
Mineral waters.....	Gallons.....	6 537 966	815 615
Natural gas.....	1000 cubic feet.....	8 124 000	2 870 000
Natural gas gasoline.....	Gallons.....	457 985	84 083
Petroleum.....	Barrels.....	851 000	3 100 000
Peat.....	Short tons.....	177	1 322
Potash (K ₂ O).....	Short tons.....	.....	<i>a</i>
Pyrite.....	Long tons.....	60 544	468 257
Salt.....	Barrels.....	13 913 064	7 159 547
Molding sand.....	Short tons.....	418 319	609 730
Other sand and gravel.....	Short tons.....	3 569 668	1 637 150
Sand-lime brick.....	Thousands.....	10 958	159 399
Slate.....	.....	.....	450 379
Granite.....	Short tons.....	49 670	94 820
Limestone <i>b</i>.....	.....	.....	5 538 581
Marble.....	Short tons.....	24 040	250 244
Sandstone.....	Short tons.....	65 050	384 516
Trap.....	Short tons.....	527 910	619 799
Miscellaneous stone.....	Short tons.....	33 590	100 775
Talc.....	Short tons.....	62 495	750 765
Zinc ore.....	Short tons.....	51 411	747 666
Other materials.....	.....	.....	461 530
Total value.....	.....	.....	\$56 415 992

a Included under other materials.*b* Includes value of lime but not value of limestone used for cement making.

Mineral production in New York in 1920

PRODUCT	UNIT OF MEASUREMENT	QUANTITY	VALUE
Portland cement.....	Barrels.....	6 049 150	\$12 206 698
Natural cement.....	Barrels.....		<i>a</i>
Building brick.....	Thousands.....	497 802	8 565 072
Pottery.....			7 308 283
Other clay products.....			3 240 329
Diatomaceous earth.....	Short tons.....		<i>a</i>
Crude clay.....	Short tons.....	8 545	43 672
Emery.....	Short tons.....	1 596	14 375
Feldspar and quartz.....	Short tons.....	22 291	166 869
Garnet.....	Short tons.....	4 276	359 425
Gems.....			<i>a</i>
Graphite.....	Pounds.....		<i>a</i>
Gypsum.....	Short tons.....	780 295	6 438 929
Iron ore.....	Long tons.....	959 408	6 263 252
Marl.....	Short tons.....		7 834
Mica.....			<i>a</i>
Millstones.....			13 331
Metallic paint.....	Short tons.....	9 936	<i>a</i>
Mineral waters.....	Gallons.....	5 242 047	671 066
Natural gas.....	1000 cubic feet.....	8 419 000	3 195 000
Natural gas gasoline.....	Gallons.....	411 078	75 576
Petroleum.....	Barrels.....	906 000	5 433 000
Peat.....	Short tons.....		<i>a</i>
Potash (K ₂ O).....	Short tons.....		<i>a</i>
Pyrite.....	Long tons.....	30 753	261 575
Salt.....	Barrels.....	13 593 578	7 584 921
Molding sand.....	Short tons.....	590 577	1 232 721
Other sand and gravel.....	Short tons.....	5 536 441	3 105 736
Sand-lime brick.....	Thousands.....	11 294	176 114
Slate.....			911 293
Granite.....	Short tons.....	78 270	204 491
Limestone <i>b</i>			7 151 151
Marble.....	Short tons.....	24 900	220 773
Sandstone.....	Short tons.....	61 610	547 424
Trap.....	Short tons.....	648 450	794 653
Miscellaneous stone.....	Short tons.....	45 130	143 215
Talc.....	Short tons.....	68 168	977 228
Zinc ore.....	Short tons.....	53 780	915 948
Other materials.....			287 453
Total value.....			\$78 517 407

a Included under other materials.*b* Includes value of lime but not value of limestone used for cement making.

Mineral production in New York in 1921

PRODUCT	UNIT OF MEASUREMENT	QUANTITY	VALUE
Portland cement.....	Barrels.....	4 993 341	\$9 403 015
Natural cement.....	Barrels.....		<i>a</i>
Building brick.....	Thousands.....	635 895	7 639 734
Pottery.....			6 789 055
Other clay products.....			3 003 297
Carbon dioxide.....	Pounds.....		<i>a</i>
Crude clay.....	Short tons.....	4 247	16 423
Diatomaceous earth.....	Short tons.....		<i>a</i>
Emery.....	Short tons.....		<i>a</i>
Feldspar and quartz.....	Short tons.....	11 577	102 094
Garnet.....	Short tons.....	2 998	258 705
Graphite.....	Pounds.....		<i>a</i>
Gypsum.....	Short tons.....	712 665	6 410 221
Iron ore.....	Long tons.....	174 368	946 366
Marl.....	Short tons.....	800	4 928
Millstones.....			14 672
Metallic paint.....	Short tons.....	2 738	<i>a</i>
Mineral waters.....	Gallons.....	5 965 049	736 173
Natural gas.....	1000 cubic feet..	6 583 000	2 798 000
Natural gas gasoline.....	Gallons.....	366 240	52 108
Peat.....	Short tons.....	841	7 200
Petroleum.....	Barrels.....	988 000	3 262 000
Potash (K ₂ O).....	Short tons.....		<i>a</i>
Pyrite.....	Long tons.....		<i>a</i>
Salt.....	Barrels.....	10 392 956	6 505 041
Molding sand.....	Short tons.....	288 354	447 481
Other sand and gravel.....	Short tons.....	5 732 875	3 225 646
Sand-lime brick.....	Thousands.....		<i>a</i>
Slate.....			516 956
Granite.....	Short tons.....	62 750	232 190
Limestone <i>b</i>			7 748 530
Marble.....	Short tons.....	32 090	255 530
Sandstone.....	Short tons.....	156 930	901 915
Trap.....	Short tons.....	112 640	201 677
Miscellaneous stone.....	Short tons.....	69 820	124 788
Talc.....	Short tons.....	37 489	464 645
Zinc ore.....	Short tons.....	39 940	157 200
Other materials.....			333 123
Total value.....			\$62 558 713

a Included under other materials.*b* Includes value of lime but not value of limestone used for cement making.

Mineral production in New York in 1922

PRODUCT	UNIT OF MEASUREMENT	QUANTITY	VALUE
Portland cement.....	Barrels.....	6 194 663	\$10 694 426
Natural cement.....	Barrels.....		<i>a</i>
Building brick.....	Thousands.....	842 688	12 233 003
Pottery.....			5 685 884
Other clay products.....			2 629 922
Carbon dioxide.....	Pounds.....	312 232	40 000
Crude clay.....	Short tons.....	5 976	20 463
Diatomaceous earth.....	Short tons.....	216	13 790
Emery.....	Short tons.....		<i>a</i>
Feldspar and quartz.....	Short tons.....	14 188	90 968
Garnet.....	Short tons.....	6 654	546 879
Graphite.....	Pounds.....		
Gypsum.....	Short tons.....	1 055 302	8 807 366
Iron ore.....	Long tons.....	191 195	1 049 050
Marl.....	Short tons.....	1 300	8 125
Millstones.....			17 025
Metallic paint.....	Short tons.....	16 541	<i>a</i>
Mineral waters.....	Gallons.....	6 965 638	800 831
Natural gas.....	1000 cubic feet.....	6 947 145	3 379 000
Natural gas gasoline.....	Gallons.....	506 200	61 415
Peat.....	Short tons.....	840	4 050
Petroleum.....	Barrels.....	1 000 000	3 200 000
Pyrite.....	Long tons.....	5 900	<i>a</i>
Salt.....	Barrels.....	14 006 193	7 066 409
Molding sand.....	Short tons.....	579 999	855 682
Other sand and gravel.....	Short tons.....	7 723 393	4 229 630
Sand-lime brick.....	Thousands.....		<i>c</i>
Slate.....			642 972
Granite.....	Short tons.....	117 800	370 471
Limestone <i>b</i>			7 469 370
Marble.....	Short tons.....	52 870	336 956
Sandstone.....	Short tons.....	332 160	1 372 429
Trap.....	Short tons.....	101 510	151 977
Miscellaneous stone.....	Short tons.....		55 471
Talc.....	Short tons.....	71 470	1 116 914
Zinc ore.....	Short tons.....	53 400	549 024
Other materials.....			144 841
Total value.....			\$73 644 343

a Included under other materials.*b* Includes value of lime but not value of limestone used for cement making.*c* Value of production not included in State total.

Mineral production in New York in 1923

PRODUCT	UNIT OF MEASUREMENT	QUANTITY	VALUE
Portland cement.....	Barrels.....	6 853 062	\$12 834 471
Natural cement.....	Barrels.....		<i>a</i>
Building brick.....	Thousands.....	989 034	15 027 424
Pottery.....			6 289 381
Other clay products.....			4 468 045
Carbon dioxide.....	Pounds.....		<i>a</i>
Crude clay.....	Short tons.....	8 247	43 701
Diatomaceous earth.....	Short tons.....	208	13 378
Emery.....	Short tons.....	461	3 427
Feldspar and quartz.....	Short tons.....	18 520	135 177
Garnet.....	Short tons.....	7 662	583 190
Gypsum.....	Short tons.....	1 361 116	10 344 745
Iron ore.....	Long tons.....	722 096	3 242 229
Marl.....	Short tons.....	1 000	7 000
Mica.....	Pounds.....		<i>a</i>
Millstones.....			14 344
Metallic paint.....	Short tons.....	14 391	77 775
Mineral waters.....	Gallons.....	6 716 154	803 433
Natural gas.....	1000 cubic feet.....	6 497 000	3 739 000
Natural gas gasoline.....	Gallons.....	408 000	44 000
Peat.....	Short tons.....	862	7 545
Petroleum.....	Barrels.....	1 250 000	4 140 000
Pyrite.....	Long tons.....	11 000	<i>a</i>
Salt.....	Barrels.....	14 756 014	7 431 155
Molding sand.....	Short tons.....	731 896	1 212 798
Sand-lime brick.....	Thousands.....	15 646	204 433
Other sand and gravel.....	Short tons.....	9 998 329	6 078 278
Slate.....			927 398
Granite.....	Short tons.....	61 220	204 578
Limestone <i>b</i>	Short tons.....	6 413 380	8 501 621
Marble.....	Short tons.....	63 570	412 875
Sandstone.....	Short tons.....	282 690	1 259 257
Trap <i>c</i>	Short tons.....	223 020	269 730
Talc.....	Short tons.....	71 304	1 079 322
Zinc ore.....	Short tons.....	63 660	1 150 968
Other materials.....			67 040
Total value.....			\$90 617 718

a Included under other materials.*b* Includes value of lime but not value of limestone for cement making. Tonnage does not include amount used in lime making.*c* Includes value of miscellaneous stone.

Mineral production in New York in 1924

PRODUCT	UNIT OF MEASUREMENT	QUANTITY	VALUE
Portland cement.....	Barrels.....	7 435 875	\$13 460 594
Natural cement.....	Barrels.....		<i>a</i>
Building brick.....	Thousands.....	1 052 761	14 118 452
Pottery.....			8 421 523
Other clay products.....			3 678 564
Carbon dioxide.....	Pounds.....		<i>a</i>
Crude clay.....	Short tons.....	5 948	31 238
Diatomaceous earth.....	Short tons.....	199	12 995
Emery.....	Short tons.....	1 610	11 426
Feldspar and quartz.....	Short tons.....	17 686	120 739
Garnet.....	Short tons.....	7 428	623 472
Gypsum.....	Short tons.....	1 474 491	14 329 246
Iron ore.....	Long tons.....	303 386	1 448 616
Marl.....	Short tons.....		<i>a</i>
Millstones.....			18 215
Metallic paint.....	Short tons.....	14 522	63 955
Mineral waters <i>b</i>	Gallons.....	6 789 182	811 465
Natural gas.....	1000 cubic feet..	6 196 000	3 632 000
Natural gas gasoline.....	Gallons.....	476 753	49 639
Peat.....	Short tons.....	508	7 438
Petroleum.....	Barrels.....	1 440 000	5 245 000
Pyrite.....	Long tons.....	7 593	16 705
Salt.....	Barrels.....	14 091 486	6 739 597
Molding sand.....	Short tons.....	607 089	1 040 735
Other sand and gravel.....	Short tons.....	12 790 451	7 542 458
Sand-lime brick.....	Thousands.....	16 529	220 851
Slate.....			962 276
Granite.....	Short tons.....	68 360	211 766
Limestone <i>c</i>	Short tons.....	6 969 060	9 461 774
Marble.....	Short tons.....	64 220	532 358
Sandstone.....	Short tons.....	303 000	1 529 590
Trap <i>d</i>	Short tons.....		238 125
Talc.....	Short tons.....	78 340	1 162 488
Zinc ore.....	Short tons.....	40 350	606 320
Other materials.....			45 872
Total value.....			\$96 395 492

a Included under other materials.*b* Quantity and value partly estimated.*c* Includes value of lime but not value of limestone for cement making. Tonnage does not include amount used in lime making.*d* Includes value of miscellaneous stone.

CARBON DIOXIDE

Carbon dioxide or carbonic acid gas exists naturally in the mineral waters of Saratoga and Ballston Springs. Artificially, carbon dioxide is produced by the calcination of limestone, dolomite and magnesite, and by the combustion of coke or coal. Until the erection of the State Reservation at Saratoga and legal restraint from pumping in 1908, the collection of carbonic acid gas was an important industry at Saratoga Springs and vicinity.

As an industry, carbon dioxide was produced at Saratoga Springs for some years previous to 1905, but the most active period was between 1904 and 1908 when the annual production ranged from 4,000,000 to 5,000,000 pounds a year. The gas is found at depths of from 150 to 600 feet and at the flush period of production 30 or more wells contributed to the output. Professor J. F. Kemp has made a special study of the Saratoga mineral springs and his report is published as New York State Museum Bulletin 159, 1912.

At present the only carbon dioxide produced at Saratoga is that recovered from the waters used at the State Reservation. The gas is compressed and sold by the State on a royalty basis. The income to the State from this source is something over \$15,000 annually.

CEMENT

Portland Cement

The 1924 production of portland cement amounted to 7,435,875 barrels with a value of \$13,460,594. This production both in number of barrels and in value is the largest ever made in the State and reflects the healthy condition of the industry, which has maintained a steady growth since its establishment in 1881. The accompanying table shows the production and values of portland cement since 1919.

Production of portland cement in New York since 1919

YEAR	BARRELS	VALUE
1919.....	4 441 250	\$7 700 406
1920.....	6 049 150	12 206 698
1921.....	4 993 341	9 403 015
1922.....	6 194 663	10 694 426
1923.....	6 853 062	12 834 471
1924.....	7 435 875	13 460 594
Total.....	35 967 341	\$66 299 610

In 1924, eight companies operating nine plants reported production of portland cement. The operating companies with location of plants are as follows:

In Columbia county, two cement plants are located at Becraft mountain near the city of Hudson. One is the Knickerbocker Portland Cement Company (International Cement Corporation), 100 State street, Albany, N. Y. The other is the Atlas Portland Cement Company (New York & New England C. & L. Company), 25 Broadway, New York, N. Y. Becraft mountain, at which the two cement plants are located, is an outlier of Silurian and Devonian limestones in which the Manlius, Coeymans and Becraft limestones are represented. With the exception of another small outlier to the northeast, known as Mount Bob, Becraft mountain contains the only limestone formations mentioned on the east side of the Hudson river.

On the west side of the Hudson river limestone formations similar to those contained in Becraft mountain extend parallel to the Hudson river, and in Greene county are located the following plants: Acme Cement Corporation, Catskill, N. Y.; Alpha Portland Cement Company, Easton, Pa. Plant at Cementon, N. Y.; Hudson Valley Portland Cement Corporation, Alsen, N. Y.

In Schoharie county the North American Cement Corporation of New York (formerly Helderberg Cement Company), 126 State street, Albany, operates a portland cement plant at Howes Cave. The quarries are in the Manlius and Coeymans limestones.

In Onondaga county the Alpha Portland Cement Company operates a plant at Jamesville. The quarry face includes the Manlius, Coeymans and Onondaga limestones.

At Portland Point, Tompkins county, the Pennsylvania Cement Company, lessees (Cayuga Operating Company, Inc), 131 East 46th street, New York, N. Y., produces portland cement from the Tully limestone.

The Glens Falls Portland Cement Company, Glens Falls, Warren county, N. Y., obtains its supply of limestone from the Trenton beds at that place.

Natural Cement

This form of cement has been manufactured in the State for more than 100 years with a total output of nearly 120,000,000 barrels. The maximum production during the past 35 years was in 1899 when there were manufactured 4,689,167 barrels. In the same year the production of portland cement amounted to but 472,386 barrels. Since that year the manufacture of natural cement has shown a rapid

decline, and at the present time this kind of cement is produced by but a single manufacturer. The plant is located at Lawrenceville, Ulster county, about one mile west of Rosendale. The single operator was A. J. Snyder, Rosendale. Although from 1900 on, the decline of the manufacture of natural cement was rapid, it was not until 1906 that the production of portland cement exceeded that of natural cement, and not until 1913 did the combined totals of the two products exceed the 1899 production. Thus in the period between 1899 and 1913 there was a decrease in the annual amount of cement produced as compared with the years immediately preceding and following those dates.

A new development in the natural cement industry is the purchase of 140 acres containing natural cement rock by the Louisville Cement Company of Louisville, Ky. The tract of land is at Newstead, near Akron, Erie county. The contract for the erection of a mill has been let, and it is expected that shipments will be made about the middle of 1926. The product is to be marketed under the name "Brixment," a cement used chiefly as a mortar.

References

Eckel, E. C.

- 1913 Portland Cement Materials and Industry in the United States. U. S. Geol. Sur. Bul. 522, p. 271-96

Lewis, F. H.

- 1898 Manufacture of Hydraulic Cement in the U. S. The Mineral Industry, v. 6, New York, p. 91-118

Newland, D. H.

- 1921 "Cement." The Mineral Resources of the State of New York. N. Y. State Mus. Bul. 223-24, p. 37-46

Ries, H. & Eckel, E. C.

- 1901 Lime and Cement Industries of New York. N. Y. State Mus. Bul. 44, p. 636-968

CLAY MATERIALS

The manufacture of clay wares is an important industry of the State. Clays suitable for common wares are widely distributed and in many sections of the State shales are abundant. Their use for clay products is much less extensive, however. The Hudson valley is the most important clay-producing district of the State. Long Island and Staten Island also have important deposits. In northern New York the Valley of Lake Champlain contains the principal source of supply. In the interior of the State the deposits are worked at widely separate localities. The shale deposits utilized are mainly of Devonian age and extend from the Catskills westward across the State.

The clay wares produced include brick, paving brick, terra cotta, fire brick, hollow building blocks, drain tile, sewer pipe and pottery. The pottery products include red earthenware, white ware, hotel china, sanitary ware, porcelain electrical supplies and saggars.

Production

The 1924 production of clay materials of all kinds amounted to \$26,218,539. Of this amount, building brick is credited with \$14,118,452, pottery, \$8,421,523, and other clay products, \$3,678,564. In 1923 the total value of the clay products amounted to \$25,784,850. The accompanying table gives the value of production for each year since 1919 of common brick, paving brick, terra cotta, pottery and other kinds, the latter including such clay products as could not well be itemized in separate columns without greatly enlarging the table. The table shows the varying values of production from year to year.

Production of clay materials in New York since 1919

YEAR	COMMON BRICK	PAVING BRICK	TERRA COTTA	POTTERY	OTHER KINDS	TOTAL
1919.....	\$6 374 979	\$252 948	\$629 213	\$5 633 355	\$1 578 091	\$14 468 586
1920.....	8 346 530	159 981	1 294 534	7 308 283	2 004 356	19 113 684
1921.....	7 351 116	225 734	1 166 560	6 789 055	1 899 621	17 432 086
1922.....	11 571 363	263 484	1 248 440	5 685 884	1 779 638	20 548 809
1923.....	14 706 098	226 642	1 773 039	6 289 381	2 789 690	25 784 850
1924.....	13 683 606	249 620	1 639 424	8 421 523	2 224 366	26 218 539
Total....	\$62 033 692	\$1 378 409	\$7 751 210	\$40 127 481	\$12 275 762	\$123 566 554

The greatest percentage of increase for the period represented by the table is shown in the terra cotta products. The units of quantity measurements for various grades of terra cotta and pottery are of a somewhat indefinite character and could not be inserted in the table. The quantity, prices and value per unit for common brick are given in another table. In the table here given it will be seen that the value of common brick is more than 50 per cent of the total output of clay materials while the total value of all products for the period reaches nearly \$124,000,000.

Common Brick

The number of common brick produced in 1924 amounted to 1,029,667,000 with a value of \$13,683,606. The average price a thousand was \$13.28. The quantity production was the largest since 1913. In value the 1923 production was the largest on record, with a value of \$14,706,098 and an average selling price a thousand of

\$15.09. During the past 20 years the highest average price a thousand (\$17.08) was in 1920; the lowest was in 1910 when the price was \$4.70. This was a year of low demand due to industrial conditions. The total state production since 1919 of common building brick, together with values and price, is given in the accompanying table.

The total number of plants in the State reporting production of common brick in 1924 was 87, distributed among 24 counties. Of this number 61 are located in the Hudson river region, comprising the counties of Albany, Columbia, Dutchess, Greene, Orange, Rens-

Production of common building brick in New York since 1919

YEAR	QUANTITY	VALUE	VALUE A THOUSAND
1919.....	479 405 000	\$6 374 979	\$13 30
1920.....	488 703 000	8 346 530	17 08
1921.....	620 628 000	7 351 116	11 84
1922.....	814 376 000	11 571 363	14 20
1923.....	974 586 000	14 706 098	15 09
1924.....	1 029 667 000	13 683 606	13 28
Total.....	4 407 365 000	\$62 033 692	.....

selaer, Rockland, Ulster and Westchester. The counties all border the Hudson river and shipments are mostly by water. This is an important factor in making the district one of the largest producers of brick in the country. Of the total value of common brick produced in the State in 1924, amounting to \$13,683,606, the share of the Hudson river district, comprising nine counties out of the 24 reporting production, amounted to \$10,648,132. The importance of the Hudson river district as a common brick producing center has made it desirable to show in tabular form the output of the region. The tables giving this information since 1919 are presented herewith. Tables for earlier years are contained in previous publications of the State Museum.

The output of common brick in the counties of the State outside of the Hudson district, amounting to 231,631,000 and valued at \$3,035,474, is given in a separate table. In accordance with agreements with operators, the county total can not be given unless there are more than two operators.

The number of plants operating in the State has decreased considerably in the past few years. In 1906, when there was the largest

production for more than 20 years, 213 plants were in operation. Of these, 131 were located in the Hudson river district and 82 in other sections of the State. The increased production of some of the yards makes up in part the loss caused by the dismantlement of a number of plants.

Paving Brick

This form of brick is manufactured in Broome, Cattaraugus and Chautauqua counties. The 1924 output amounted to 9,070,000 valued at \$249,620, the average price a thousand being \$27.52. In addition, vitrified block was reported by the firm operating in Cattaraugus county. The values of production for paving brick since 1919 are given in the table showing production of clay materials.

Face Brick

Four firms reported production of face brick in 1924. The output amounted to 23,094,000 with a value of \$434,846. The price a thousand was \$18.82.

Fire Brick

The production of fire brick in 1924 amounted to 4,277,000, valued at \$521,456. The average selling price was \$121.92 a thousand. The output was made by four firms.

Building Tile

Production of hollow building tile was reported by seven establishments. The production which is given in tons amounted to 60,150 valued at \$398,222.

Drain Tile

Six firms produced drain tile to the amount of 3790 tons with a value of \$30,589. The price a ton was \$8.07.

Sewer Pipe

Only one establishment reported the manufacture of sewer pipe and the figures of production can not be given.

Stove Lining

This material was reported by three firms to the amount of 1708 tons, valued at \$91,253 with a selling price of \$53.42 a ton.

Terra Cotta

The production of architectural terra cotta in 1924 amounted to 15,509 tons having a value of \$1,639,424. The selling price was \$105.70 a ton. Production was reported by three firms.

Refractory Cement

This material was reported by three firms to the amount of 1559 tons valued at \$76,151, with an average price of \$48.84 per ton.

Pottery

Among the pottery products for 1924, amounting to \$8,421,523, hotel china was valued at \$3,905,509; porcelain electrical supplies, \$4,004,046; and saggars, \$286,204.

Output of common brick in the Hudson river region for 1919

COUNTY	NUMBER OF OPERATORS	OUTPUT	VALUE	PRICE A THOUSAND
Albany.....	10	34 779 000	\$441 137	\$12 68
Columbia <i>a</i>	2	24 795 000	286 262	11 55
Dutchess.....	9	28 670 000	395 817	13 81
Greene.....	4	13 056 000	149 668	11 46
Orange.....	3	30 809 000	379 757	12 33
Rensselaer <i>a</i>	2	.....	.....	.....
Rockland.....	15	46 238 000	692 760	14 98
Ulster.....	17	143 861 000	1 976 497	13 74
Westchester.....	4	5 949 000	65 741	11 05
Total.....	66	328 157 000	\$4 387 639	\$13 37

a The output of Rensselaer county is included with that of Columbia county.

Output of common brick in the Hudson river region for 1920

COUNTY	NUMBER OF OPERATORS	OUTPUT	VALUE	PRICE A THOUSAND
Albany.....	10	49 168 000	\$942 122	\$19 16
Columbia.....	2	21 883 000	399 879	18 27
Dutchess.....	10	28 035 000	438 727	15 65
Greene.....	4	19 428 000	287 153	14 78
Orange.....	3	26 339 000	468 749	17 80
Rensselaer <i>a</i>	2	.....	.....	.....
Rockland.....	15	63 785 000	1 043 584	16 36
Ulster.....	19	125 757 000	2 117 466	16 84
Westchester <i>a</i>	2	.....	.....	.....
Total.....	67	334 395 000	\$5 697 680	\$17 04

a The output of Westchester and Rensselaer counties is included with that of Columbia county.

Output of common brick in the Hudson river region for 1921

COUNTY	NUMBER OF OPERATORS	OUTPUT	VALUE	PRICE A THOUSAND
Albany.....	8	50 327 000	\$642 240	\$12 76
Columbia <i>a</i>	2	.....	.....	.....
Dutchess.....	8	42 688 000	460 709	10 79
Greene <i>b</i>	2	.....	.....	.....
Orange.....	2	74 198 000	847 380	11 42
Rensselaer <i>a</i>	2	.....	.....	.....
Rockland.....	11	74 354 000	1 017 898	13 68
Ulster.....	18	204 853 000	2 313 201	11 29
Westchester.....	1	35 257 000	448 440	12 71
Total.....	54	481 677 000	\$5 739 868	\$11 92

a The output of Columbia and Rensselaer counties is included with that of Westchester county.*b* The output of Greene county is included with that of Orange county.

Output of common brick in the Hudson river region for 1922

COUNTY	NUMBER OF OPERATORS	OUTPUT	VALUE	PRICE A THOUSAND
Albany.....	8	75 065 000	\$1 113 577	\$14 84
Columbia <i>a</i>	4	48 755 000	728 045	14 93
Dutchess.....	7	50 443 000	719 375	14 26
Greene <i>b</i>	4	96 203 000	1 360 944	14 15
Orange.....	.....	.....	.....	.....
Rensselaer.....	.....	.....	.....	.....
Rockland.....	12	99 371 000	1 534 317	15 44
Ulster.....	17	210 631 000	2 906 913	13 80
Westchester.....	.....	.....	.....	.....
Total.....	52	580 468 000	\$8 363 171	\$14 41

a Includes Columbia, Rensselaer and Westchester counties.*b* Includes Greene and Orange counties.

Output of common brick in the Hudson river region for 1923

COUNTY	NUMBER OF OPERATORS	OUTPUT	VALUE	PRICE A THOUSAND
Albany.....	9	99 127 000	\$1 629 629	\$16 44
Columbia <i>a</i>	2	.....	.....	.....
Dutchess.....	9	74 559 000	1 100 093	14 75
Greene.....	3	30 946 000	446 594	14 43
Orange.....	2	115 621 000	1 810 527	15 65
Rensselaer <i>b</i>	2	.....	.....	.....
Rockland.....	14	127 723 000	1 938 803	15 18
Ulster.....	20	237 389 000	3 570 216	15 04
Westchester.....	2	44 104 000	556 334	12 61
Total.....	63	729 469 000	\$11 052 196	\$15 15

a The output of Columbia county is included with that of Orange county.

b The output of Rensselaer county is included with that of Westchester county.

Output of common brick in the Hudson river region for 1924

COUNTY	NUMBER OF OPERATORS	OUTPUT	VALUE	PRICE A THOUSAND
Albany.....	9	113 840 000	\$1 708 247	\$15 00
Columbia.....	2	93 705 000	1 211 585	12 93
Dutchess.....	9	79 922 000	1 032 255	12 92
Greene.....	3	33 544 000	441 063	13 15
Orange.....	2	86 403 000	1 147 753	13 28
Rensselaer <i>a</i>	2	.....	.....	.....
Rockland.....	13	117 085 000	1 491 896	12 74
Ulster.....	20	273 537 000	3 615 333	13 22
Westchester <i>b</i>	1	.....	.....	.....
Total.....	61	798 036 000	\$10 648 132	\$13 34

a The output of Rensselaer county is included with that of Columbia county.

b The output of Westchester county is included with that of Orange county.

Production of common brick in New York State outside of the Hudson river district for 1924

COUNTY	NUMBER OF OPERATORS	OUTPUT	VALUE
Broome.....	1	7 260 000	\$116 601
Cattaraugus <i>a</i>	1	.....	.....
Chautauqua <i>a</i>	1	.....	.....
Chemung.....	1	23 189 000	312 985
Erie.....	4	31 563 000	372 180
Livingston <i>b</i>	1	.....	.....
Monroe <i>b</i>	1	.....	.....
Montgomery <i>c</i>	1	.....	.....
Nassau.....	2	14 252 000	175 971
Oneida <i>d</i>	1	.....	.....
Onondaga.....	3	16 740 000	274 360
Richmond.....	2	36 100 000	407 400
Saratoga.....	4	89 870 000	1 202 255
Steuben <i>e</i>	1	.....	.....
Suffolk.....	2	12 657 000	173 722
Total.....	26	231 631 000	\$3 035 474

a Included in Broome county.
b Included in Chemung county.
c Included in Nassau county.

d Included in Richmond county.
e Included in Suffolk county.

List of manufacturers of clay materials reporting production for 1924

LOCATION OF PLANT	COMMON BRICK	ADDRESS
<i>Albany county</i>		
Albany.....	Murray & Riberdy.....	52 Van Woert street, Albany
Albany.....	Edward J. Smith.....	First avenue, Albany
Coeymans.....	Adams Brothers.....	Coeymans
Coeymans.....	Powell & Minnock.....	Coeymans
Coeymans.....	Roah Hook Brick Co.....	Coeymans
Coeymans.....	Sutton & Suderley Brick Com- pany.....	Coeymans
Cohoes.....	Cary Brick Company.....	Mechanicville
Cohoes.....	Cohoes Brick Co.....	Cohoes
Watervliet.....	Joseph Bleau.....	Watervliet
<i>Broome county</i>		
Binghamton.....	Binghamton Brick Co., Inc...	Binghamton
<i>Cattaraugus county</i>		
Olean.....	Sterling Brick Co.....	Olean
<i>Chautauqua county</i>		
Jamestown.....	Jamestown Shale Paving Brick Company.....	Jamestown
<i>Chemung county</i>		
Horseheads.....	Consolidated Brick Co.....	Horseheads
<i>Columbia county</i>		
Stockport.....	Empire Brick & Supply Co...	103 Park avenue, New York City
Stuyvesant.....	Cary Brick Company.....	Mechanicville
<i>Dutchess county</i>		
Poughkeepsie.....	Allen & Terwilliger Brick Yard	Arlington
Brockway.....	Belle Isle Brick Works.....	Brockway (Beacon)
Beacon.....	Denning's Point Brick Works.	Newburgh
Beacon.....	Patrick J. McGrath.....	Haverstraw
Beacon.....	Ziegler & Company.....	Beacon
Brockway.....	The Brockway Brick Co.....	Brockway
Chelsea.....	Frank B. Watrous.....	Chelsea
Fishkill.....	William K. Hammond.....	628 W. 52d street, New York
Dutchess Junction...	Nicholson Brothers.....	Dutchess Junction
<i>Erie county</i>		
Buffalo.....	John Dietschler.....	Weiss & Griswold streets, Buffalo
Jewettville.....	Ellicott Brick Co.....	920 Ellicott square, Buffalo
Shaleton.....	Acme Shale Brick Co.....	1153 Main street, Buffalo
North Collins.....	North Collins Shale Brick Company.....	10 Builders Exchange Building, Buffalo
<i>Greene county</i>		
Athens.....	Gladfelter & Son.....	Athens
Catskill.....	Geo. W. Washburn Co.....	Catskill
Athens.....	Mayone Brick Co., Inc.....	Saugerties
<i>Livingston county</i>		
Sonyea.....	Craig Colony.....	Sonyea

LOCATION OF PLANT	COMMON BRICK	ADDRESS
<i>Monroe county</i>		
Maplewood.....	Rochester Clay Brick & Tile	
Chili.....	Corporation.....	Rochester
<i>Montgomery county</i>		
Amsterdam.....	Henry C. Grieme Co.....	Amsterdam
<i>Nassau county</i>		
Bethpage.....	Long Island Brick Co., Inc...	Farmingdale
Glen Head.....	Jotham Post.....	Glen Head
<i>Oneida county</i>		
Marcy.....	Mohawk Valley Brick Supply Co., Inc.....	Utica
<i>Onondaga county</i>		
Dewitt.....	Syracuse Brick Corp.....	Syracuse
Salina.....	Geo. W. Pack & Son, Inc....	Syracuse
Warner.....	Onondaga Brick & Tile Corp.	Warner
<i>Orange county</i>		
Roseton.....	The Jova Brick Works.....	Roseton
Roseton.....	Roseton Brick Corp.....	Roseton
<i>Rensselaer county</i>		
Troy.....	Troy Brick Company.....	Troy
Hemstreet Park....	Champlain Brick Co.....	Mechanicville
<i>Richmond county</i>		
Green Ridge.....	American Brick Corp.....	Green Ridge
Green Ridge.....	Dolan Brick Co., Inc.....	Green Ridge
<i>Rockland county</i>		
Grassy Point.....	James J. Byrnes.....	Haverstraw
Haverstraw.....	George Archer.....	Haverstraw
Haverstraw.....	James A. Brophy.....	Haverstraw
Haverstraw.....	The DeNoyelles Brick Co....	Haverstraw
Haverstraw.....	Excelsior Brick Co.....	Haverstraw
Haverstraw.....	Everett Fowler & Son.....	Haverstraw
Haverstraw.....	The Garner Brick Works....	Haverstraw
Haverstraw.....	Hudson River Brick Co., Inc..	Haverstraw
Haverstraw.....	Malley Brick Company.....	Haverstraw
Haverstraw.....	E. N. Renn & Co.....	Haverstraw
Haverstraw.....	Joseph Shankey Brick Co....	Haverstraw
Stony Point.....	Morrissey & Company.....	Haverstraw
Stony Point.....	Dunnigan Brick Co.....	Stony Point
<i>Saratoga county</i>		
Crescent.....	Aetna Brick & Fireproofing Co., Inc.....	Cohoes
Crescent.....	Crescent Brick Co.....	Crescent
Mechanicville.....	New England Brick Co.....	Mechanicville
Stillwater.....	Duffney Brick Co.....	Stillwater
<i>Steuben county</i>		
Corning.....	Corning Shale Brick Corp....	Corning
<i>Suffolk county</i>		
Southold.....	C. L. Sanford Brick Co., Inc..	Southold
Greenport.....	Sage Brick Mfg. Co., Inc....	Greenport

LOCATION OF PLANT	COMMON BRICK	ADDRESS
<i>Ulster county</i>		
Glasco.....	Empire Brick & Supply Co....	103 Park avenue, New York
Glasco.....	Washburn Brothers Co.....	Glasco
Kingston.....	Brigham Brothers.....	R. D. 4, Kingston
Kingston.....	Theodore F. Gardner (now Dwyer Bros.).....	Kingston
Kingston.....	Philip Goldrick & Sons.....	Kingston
Kingston.....	Hendricks Brick Company....	Kingston
Ulster.....	Hanrahan Brick & Ice Co....	Kingston
Kingston.....	The Hutton Company.....	221 E. Strand street, Kingston
Kingston.....	Kingston Brick & Ice Co....	Kingston
Kingston.....	Lynch Brothers Co.....	Kingston
Ulster.....	Rose Brothers.....	Kingston
Kingston.....	Chas. S. Shultz & Son, Inc....	Box 135, Hoboken, N. J.
Kingston.....	Staples Brick Company.....	Kingston
Malden.....	Staples Brick Company.....	Kingston
Kingston.....	The Terry Brothers Company (two plants).....	Kingston
New Paltz.....	Lowe Brick Company.....	New Paltz
Ulster.....	Brophy Brothers.....	Grassy Point
E. Kingston.....	W. J. & J. T. Washburn Brick Company.....	Kingston
Ulster Park.....	Est. of Christian Schloed....	Ulster Park
Saugerties.....	P & M Brick Mfg. Co.....	New York

Westchester county

Montrose.....	Milan Brick Company.....	Montrose
---------------	--------------------------	----------

VITRIFIED PAVING BRICK

Broome county

Binghamton.....	Binghamton Brick Co., Inc....	Binghamton
-----------------	-------------------------------	------------

Cattaraugus county

Olean.....	Sterling Brick Co.....	Olean
------------	------------------------	-------

Chautauqua county

Jamestown.....	Jamestown Shale Paving Brick Company.....	Jamestown
----------------	---	-----------

VITRIFIED BRICK OR BLOCK
OTHER THAN PAVING*Cattaraugus county*

Olean.....	Sterling Brick Company.....	Olean
------------	-----------------------------	-------

FACE BRICK

Broome county

Binghamton.....	Binghamton Brick Co., Inc....	Binghamton
-----------------	-------------------------------	------------

Erie county

Jewettville.....	Jewettville Clay Products Company.....	123 W. Chippewa street, Buffalo
Shaleton.....	Acme Shale Brick Co.....	1153 Main street, Buffalo

Steuben county

Corning.....	Corning Shale Brick Corp....	Corning
--------------	------------------------------	---------

LOCATION OF PLANT	ARCHITECTURAL TERRA COTTA	ADDRESS
<i>Queens county</i>		
Long Island City....	New York Architectural Terra Cotta Co.	401 Vernon avenue, Long Island City

<i>Richmond county</i>		
Tottenville.....	Atlantic Terra Cotta Co.....	350 Madison avenue, New York

<i>Steuben county</i>		
Corning.....	Corning Terra Cotta Co.....	Corning

HOLLOW BUILDING TILE

<i>Erie county</i>		
Town Line.....	Lancaster Brick & Tile Co....	48 W. Eagle street, Buffalo
Shaleton.....	Acme Shale Brick Co.....	1153 Main street, Buffalo
Angola.....	Lyth Tile Corporation.....	Buffalo

<i>Niagara county</i>		
Beach Ridge.....	Central Clay Products Co....	North Tonawanda

<i>Onondaga county</i>		
Warner.....	Onondaga Brick & Tile Corp.	Warner

<i>Rensselaer county</i>		
Troy.....	Troy Fireproofing Co.....	Troy

CERAMIC MOSAIC

<i>Cattaraugus county</i>		
Olean.....	Olean Tile Company.....	Olean

DRAIN TILE

<i>Erie county</i>		
Town Line.....	Lancaster Brick & Tile Co...	Buffalo
Shaleton.....	Acme Shale Brick Company..	1153 Main street, Buffalo
Angola.....	Lyth Tile Corporation.....	Buffalo

<i>Livingston county</i>		
Sonyea.....	Craig Colony.....	Sonyea

<i>Monroe county</i>		
Maplewood.....	Rochester Clay Brick & Tile Corporation.....	Rochester

<i>Ontario county</i>		
Geneva.....	Dove & Son.....	Geneva

SEWER PIPE

<i>Monroe county</i>		
Rochester.....	New York & Pennsylvania Clay Products Co.....	Rochester

STOVE LINING

<i>Erie county</i>		
Buffalo.....	Hall & Sons.....	Buffalo

<i>Rensselaer county</i>		
Troy.....	McLeod & Henry Co.....	Troy

LOCATION OF PLANT	STOVE LINING	ADDRESS
	<i>Westchester county</i>	
Peekskill.....	Peekskill Fire Brick Works...	Peekskill

FIRE BRICK

Erie county

Buffalo.....	Hall & Sons.....	Buffalo
--------------	------------------	---------

Kings county

Brooklyn.....	Brooklyn Fire Brick Works...	Brooklyn
---------------	------------------------------	----------

Rensselaer county

Troy.....	McLeod & Henry Co.....	Troy
-----------	------------------------	------

Westchester county

Peekskill.....	Peekskill Fire Brick Works...	Peekskill
----------------	-------------------------------	-----------

CLAY PRODUCTS NOT ELSEWHERE
SPECIFIED; (WALL COPING,
FLUE LINING, ETC.)*Erie county*

Shaleton.....	Acme Shale Brick Co.....	1153 Main street, Buffalo
---------------	--------------------------	---------------------------

Kings county

Brooklyn.....	Henry Bieg.....	Brooklyn
---------------	-----------------	----------

Rensselaer county

Troy.....	Troy Fireproofing Co.....	Troy
-----------	---------------------------	------

REFRACTORY CEMENT

Oneida county

Rome.....	Adams & Jewell.....	Rome
-----------	---------------------	------

RED EARTHENWARE

Westchester county

North Tarrytown...	Etruscan Pottery Corp.....	North Tarrytown
--------------------	----------------------------	-----------------

WHITE WARE, ETC.

Kings county

Brooklyn.....	Empire China Works.....	Brooklyn
---------------	-------------------------	----------

HOTEL CHINA

Erie county

Buffalo.....	Buffalo Pottery.....	Hayes & Seneca streets, Buffalo
--------------	----------------------	------------------------------------

Onondaga county

Solvay.....	Iroquois China Co.....	Solvay
Salina.....	Onondaga Pottery Co.....	Syracuse
Syracuse.....	Onondaga Pottery Co.....	Syracuse

SANITARY WARE

Erie county

Lackawanna.....	Jewett Refrigerator Co.....	Buffalo
-----------------	-----------------------------	---------

LOCATION OF PLANT	PORCELAIN ELECTRICAL SUPPLIES	ADDRESS
<i>Genesee county</i>		
LeRoy.....	Lapp Insulator Co.....	LeRoy
<i>Kings county</i>		
Brooklyn.....	Empire China Works.....	Brooklyn
<i>Ontario county</i>		
Victor.....	Locke Insulator Corp.....	Victor
<i>Schenectady county</i>		
Schenectady.....	General Electric Co.....	1 River street, Schenec- tady

SAGGERS

Erie county

Buffalo.....	Buffalo Pottery.....	Hayes & Seneca streets, Buffalo
--------------	----------------------	------------------------------------

Kings county

Brooklyn.....	Empire China Works.....	Brooklyn
---------------	-------------------------	----------

Onondaga county

Solvay.....	Iroquois China Co.....	Solvay
Salina.....	Onondaga Pottery Co.....	Syracuse
Syracuse.....	Onondaga Pottery Co.....	Syracuse

Schenectady county

Schenectady.....	General Electric Co.....	1 River street, Schenec- tady
------------------	--------------------------	----------------------------------

OTHER POTTERY PRODUCTS IN- CLUDING DENTAL PORCELAIN, ART POTTERY, CLAY TOBACCO PIPES, ETC.

Erie county

Lackawanna.....	Jewett Refrigerator Co.....	Buffalo
-----------------	-----------------------------	---------

Queens county

Elmhurst.....	Elmhurst Clay Pipe Works...	Flushing
---------------	-----------------------------	----------

Westchester county

Bedford.....	Volkmar-Durant Kilns.....	Bedford
--------------	---------------------------	---------

References

Beck, Lewis C.

1842 Mineralogy of New York, p. 1-445

Bishop, Irving P.

1898 Structural and Economic Geology of Erie County. N. Y. State
Mus. 49th Ann. Rep't, v. 2, p. 305-92

Hall, James

1843 Geology of New York. Survey of the Fourth Geological Dis-
trict, p. 1-499

Jones, R. W.

1914 The Manufacture of Paving Brick in New York State. N. Y.
State Mus. Bul. 174, p. 23-31

- Luther, D. Dana**
1898 Economic Geology of Onondaga County. N. Y. State Mus. 49th Ann. Rep't, v. 2, p. 237-303
- Nason, F. L.**
1894 Economic Geology of Albany County. N. Y. State Mus. 47th Ann. Rep't, p. 457-81
- Newland, D. H.**
1921 Clay Materials. The Mineral Resources of the State of New York. N. Y. State Mus. Bul. 223-24, p. 47-64
- Ries, H.**
1891 Quaternary Deposits of the Hudson River Valley between Croton and Albany, etc. N. Y. State Geologist 10th Ann. Rep't, p. 110-55
1898 Physical Tests of the Devonian Shales of New York State To Determine Their Value for the Manufacture of Clay Products. N. Y. State Mus. 49th Ann. Rep't, v. 2, p. 673-98
1898a Geology of Orange County. N. Y. State Mus. 49th Ann. Rep't, v. 2, p. 393-475
1900 Clays of New York, Their Properties and Uses. N. Y. State Mus. Bul. 35, p. 493-944
- Woodworth, J. B.**
1901 Pleistocene Geology of Nassau County and Borough of Queens. N. Y. State Mus. Bul. 48, p. 617-70

CRUDE CLAY

In addition to clay used in the manufacture of clay products, certain clays are sold and shipped in a crude or raw state. By far the greater part of the clay mined is a slip clay, and it is all obtained within the limits of the city of Albany. A small amount of the crude clay mined is sold as a fire clay. The production of crude or raw clay during the past five years is given in the following table:

Production of crude clay

YEAR	TONS	VALUE
1920.....	8 545	\$43 672
1921.....	4 247	16 423
1922.....	5 976	20 463
1923.....	8 247	43 701
1924.....	5 948	31 238
Total.....	32 963	\$155 497

"A slip clay is one that contains such a high percentage of fluxing impurities, and is of such texture, that it melts at a low cone to a greenish or brown glass, thus forming a natural glaze. It must be fine-grained, free from lumps or concretions, show a low air-shrinkage, and mature in burning as little above Cone 5 as possible. While easily fusible clays are not uncommon, all do not melt to a good glaze.

"A good slip clay makes a glaze which is free from defects common to artificial glazes. It will fit a wide range of clays, and since it is a natural clay it will undergo the same changes in burning as the body on which it is placed. Artificial mixtures of exactly similar composition to the natural clays have failed to give the excellent results as to gloss or color that are attained by the natural clay.

"Several fair slip clays have been found in different parts of the country, but the most thoroughly satisfactory material comes from Albany, N. Y., and is shipped to all parts of United States for potters' use." *Clay Products Cyclopedia*, 1924, p. 35.

An average of the analyses of eight dried samples of slip clay from one of the Albany deposits is as follows:

Silica	54.55
Titanium oxide	0.31
Alumina	17.06
Ferrous oxide	6.43
Manganese oxide	0.11
Lime	5.80
Magnesia	2.05
Alkalies	5.19
Comb. water and organic matter.....	8.46
Total	<u>99.96</u>

Vitrification point of the eight samples varied between 1784 and 1890 degrees Fahrenheit, and the fusion point between 2163 and 2269 degrees Fahrenheit.

DIATOMACEOUS EARTH

Diatomaceous earth is a friable, finely divided, earthy deposit found in certain fresh water lakes and consists of the remains of microscopic plants called diatoms. In appearance it closely resembles chalk or fine marl, but its base is silica instead of lime carbonate. Chemically, it differs from ordinary quartz in that it shows the presence of considerable water combined with the silica. Mineralogically, it may be regarded as an opal variety of silica.

Uses

Because of its hardness and uniform fineness of grain, diatomaceous earth makes a good abrasive and, as such, is extensively used in polishing powders and scouring materials for metals. It is also used as a filtering agent, as an insulator for boilers and steam pipes and in fireproofing, as an ingredient in phonographic records and as an absorbent in artificial fertilizers. It also finds use in the manufacture of water glass, cements, glazes, artificial stone, paints and pigments, fireworks and matches.

Occurrence

The principle deposits of diatomaceous earth are found in some of the Adirondack lakes. The best-known deposits are in the lakes of Herkimer county, of which White Lead lake has been for a number of years the main source of supply. In this lake, the deposit lies below four feet of water and has a thickness of from two to 30 feet over an area of four acres. Operations are carried on by the Adirondack Diatomaceous Earth Company, Herkimer, N. Y. The dredged material is prepared for market by washing and collecting in settling vats after which it is compressed under power and dried in kilns. At present the entire output of the company is sold for use in silver polish. The annual output during the past few years has averaged more than 200 tons with a selling price of about \$65 a ton. An analysis of the material recorded in New York State Museum Bulletin 15 is as follows:

SiO ₂	86.515
Al ₂ O ₃	0.449
Fe ₂ O ₃	0.374
CaO	0.120
H ₂ O & Volatile	12.120
Undetermined	0.442
Total	100.020

References

- Cox, Charles F.**
 1893 On Recently Discovered Deposits of Diatomaceous Earth in the Adirondacks. N. Y. Acad. Sci. Trans. v. 12:219-20
 1893a Additional Notes on Recently Discovered Deposits of Diatomaceous Earth in the Adirondacks. *Op. cit.*, v. 13:98-101
- Merrill, F. J. H.**
 1895 Mineral Resources of New York State. N. Y. State Mus. Bul. 15, p. 555-56
- Newland, D. H.**
 1921 Diatomaceous Earth. The Mineral Resources of the State of New York. N. Y. State Mus. Bul. 223-24, p. 64-66

EMERY

Emery is an impure granular corundum (Al₂O₃) mixed with magnetite. In New York, emery has been mined for the past 35 years in the vicinity of Peekskill, Westchester county, from an igneous area comprising what is known as the Cortlandt series. The rocks of the area include many distinctive types of which the norites are the most prominent. In age, the Cortlandt series is later than Precambrian and possibly may be later than Ordovician.

The emery occurs in the Peekskill district as lenses, pockets and veins. Mining is carried on mainly by the usual open cut methods, but in a few cases tunnels have been driven and shafts sunk. The mined emery ore is sorted by hand and hauled by truck to the shipping point at Peekskill.

Character of the Ores

Several types of emery ore are recognized in the Peekskill district. They include spinel emery, feldspathic emery, quartz emery schist and "pure" emery. The latter grade contains little else but corundum and magnetite. The best ores contain about 50 per cent corundum as a maximum. The following analyses are quoted from a paper by Rogers (see reference at end of this chapter).

Analyses of emery from Peekskill district

	14	15	16	17
SiO ₂	1.93 ^a	.84 ^a	10.60	47.16
Al ₂ O ₃	68.14	59.22	43.72	28.96
Fe ₂ O ₃	1.43	16.66	13.75	6.15
FeO.....	16.25	14.02	20.11	8.49
MgO.....	10.02	3.54	8.59	3.80
CaO.....	trace	trace	.08	2.03
Na ₂ O.....	trace	trace	.56	.62
K ₂ O.....	trace	trace	.52	.35
H ₂ O+.....	1.15	2.65	.85	.77
H ₂ O.....	.12	.05	.07	.10
TiO ₂	1.41	3.28	1.43	1.48
P ₂ O ₅	trace	trace	trace	.02
S.....	.05	.06	.07	trace
Cr ₂ O ₃	.04	trace	.06	trace
MnO.....	trace	.06	.10	.05
	100.54	100.38	100.51	99.98

^a Probably derived in considerable part from the agate mortar.

14 Spinel emery, high grade, Buckbee Mine.

15 Pure emery, Dalton Mine.

16 Feldspathic emery, Salt Hill.

17 Quartz emery schist, Salt Hill.

All analyses made by G. S. Rogers.

Production

The accompanying table shows the production of emery in the Peekskill district for a 12-year period, during which the output has varied considerably. The unusually large tonnages recorded for the years 1916 and 1917 were due to the shutting off of imports, supplied mainly in normal times by Grecian and Turkish mines. According to figures of the United States Geological Survey, the 1923 imports of

emery and corundum were unusually large and had a value of \$722,-688. In addition to the domestic supplies of emery mined in the Peekskill district of New York, Virginia is the only other state where emery mining is carried on at the present time. Formerly mines at Chester, Mass., were operated, but the supplies are reported to be exhausted.

Production of emery in New York since 1913

YEAR	SHORT TONS	VALUE
1913.....	611	\$7 332
1914.....	763	9 105
1915.....	3 895	42 591
1916.....	15 282	123 901
1917.....	15 941	170 223
1918.....	8 183	61 660
1919.....	1 563	13 459
1920.....	1 596	14 375
1921 }	817	6 421
1922 }		
1923.....	461	3 427
1924.....	1 610	11 426
Total.....	50 722	\$463 920

The following operators reported production from the Peekskill district in 1924: Blue Corundum Mining Company, Easton, Pa.; Keystone Emery Mills, Frankford, Philadelphia, Pa.; Niagara Emery Mills, Inc., Frankford, Philadelphia, Pa.; Smith and Ellis, Peekskill, N. Y.; J. R. Lancaster, Adamite Abrasive Co., Box 222, Peekskill, N. Y.

References

Magnus, Harry C.

1904 Abrasives of New York State. N. Y. State Geol. 23d Ann. Rep't, p. 158-79

Nevius, J. N.

1901 Emery Mines of Westchester County. N. Y. State Geol. 19th Ann. Rep't, p. 1151-1154; same, N. Y., State Mus. 53d Ann. Rep't, v. 1. p. 1151-1154

Newland, David H.

1921 Emery. The Mineral Resources of the State of New York. N. Y. State Mus. Bul. 223-24, p. 66-69

Rogers, G. Sherburne

1911 Geology of the Cortlandt Series and Its Emery Deposits. N. Y. Acad. Sci. Annals, v. 21, p. 11-86

FELDSPAR

The occurrence of feldspar in New York State is limited to the two Precambrian areas, represented by the Adirondacks and the Highlands of the Hudson. The important sources of feldspar are

the pegmatites, which are coarse-textured rocks that occur in dikes and small bosses. In composition, the pegmatites are much like granites, the chief minerals being feldspar, quartz and mica. Other minerals often in large crystals, such as hornblende, beryl and tourmaline, are found associated with the chief components of the pegmatite vein.

Feldspar as mined in New York State includes several mineral species that vary considerably in chemical composition and in crystal properties as well. Orthoclase and microcline are potash feldspars and, when pure, contain 16.8 per cent potash, 18.4 per cent alumina, and 64.7 per cent silica. Albite is a soda feldspar and in pure form contains 11.8 per cent soda, 19.5 per cent alumina and 68.7 per cent silica. Intermediate between the orthoclase and albite varieties are several other feldspars which in composition show gradations from the pure potash form on the one hand to the pure soda feldspar on the other. Moreover, intergrowths of the various feldspars may be found in association.

Feldspar has many uses. The chief use of the potash form is in the pottery industry for the making of porcelain, china and sanitary and electrical supplies. Feldspar for these purposes should be free from iron, a mere trace of iron condemning it for any of the high-grade china and pottery wares. The presence of quartz with feldspar up to a certain percentage is not objectionable since quartz is a necessary ingredient of the pottery mix.

Another important use of feldspar is in the manufacture of enamel ware, glazed brick and terra cotta. For these purposes albite is in demand because of its employment at a lower melting point than the orthoclase type. Ground feldspar is used in the manufacture of washing powders and scouring soaps and is employed in the making of abrasive wheels, being mixed with emery or carborundum.

The various unsorted minerals of the pegmatite dikes, when crushed, are used for roofing material and also are employed in the manufacture of artificial stone, serving as facing to imitate granite. The extraction of potash from feldspar has been attempted, and many processes have been patented for its recovery. While a number of these processes have proved workable, the production costs have thus far been prohibitive.

In the tables of production which follow, feldspar and quartz are combined since in some cases the feldspar and quartz were sold as mined and it has been impossible to segregate the production of either for certain years.

Production of feldspar and quartz since 1919

YEAR	SHORT TONS	VALUE
1919.....	10 412	\$84 901
1920.....	22 291	166 869
1921.....	11 577	102 094
1922.....	14 188	90 968
1923.....	18 520	135 177
1924.....	17 686	120 739
Total.....	94 674	\$700 748

In the Adirondack region the principal occurrences of feldspar are at its borders and some of the localities are as follows: Crown Point and Ticonderoga, Essex county; Chestertown, Warren county; Fort Ann, Washington county; Edinburg and Corinth, Saratoga county; Mayfield, Fulton county; DeKalb and Fine, St Lawrence county; and Kushaqua, Franklin county. In southeastern New York, the important feldspar deposits are in Bedford township, Westchester county.

The companies reporting production of feldspar in 1924, were the Bedford Mining Co., Inc., Bedford; Green Hill Mining Co., Inc., Gouverneur, with mine in town of DeKalb; and the Adirondack Spar Mining Co., Ticonderoga. The United States Feldspar Corp., Gloversville, has an experimental plant at Cranberry Creek in the town of Mayfield, Fulton county, but had no commercial output in 1924.

References

Bastin, E. S.

- 1910 Economic Geology of the Feldspar Deposits of the United States. U. S. Geol. Sur. Bul. 420, p. 54-63

Newland, D. H.

- 1916 Quarry Materials of New York. N. Y. State Mus. Bul. 181, p. 154-75

- 1921 Feldspar. The Mineral Resources of the State of New York. N. Y. State Mus. Bul. 223-24, p. 69-76

Ries, H.

- 1900 Clays of New York, Their Properties and Uses. N. Y. State Mus. Bul. 35, p. 841-43

Taylor, A. S.

- 1924 Feldspar. A Mineral Having Many Uses. Compressed Air Magazine, Sept. 1924, p. 985-88

FULLER'S EARTH

Deposits of fuller's earth were formerly worked in Oneida county, but of late years there has been no production. The Oneida county deposits are the only ones of quantity thus far reported in the state.

In appearance fuller's earth resembles clay, but it usually lacks the plasticity of the latter mineral. In chemical composition except for a higher water percentage it does not differ much from ordinary clay. The alumina content is usually less than 25 per cent. Dry fuller's earth when touched to the tongue is more adhesive than most clays, and when partially submerged in water it will absorb the water, swell and crumble or flow. Practical tests are necessary to determine the commercial worth of any particular deposit of fuller's earth.

Formerly fuller's earth was used almost exclusively for fulling or cleansing of cloth, but its use now has been widely extended to refining operations and large quantities are employed in decolorizing oils both vegetable and mineral, such as cottonseed oil and petroleum. Minor uses for fuller's earth include its employment in the manufacture of pigments, and its use as a substitute for talc and as a reagent in food analysis.

The New York deposits of fuller's earth have been described by Dr H. Ries in New York State Museum Bulletin 35, pages 848-51, as follows:

In New York, deposits of fuller's earth occur at a locality known as McConnellsville, 12 miles north of Rome on the Rome, Watertown & Ogdensburg railroad. The deposit has been worked for several years by the New York Fuller's Earth Co., and is a fine-grained, dense, Quaternary clay in layers 2 to 8 inches thick, interbedded with layers of sand of similar thickness. The total thickness exposed is about 15 feet, and there is a capping of about 4 feet of sand. To mine the earth, the overlying sand has to be stripped off and the layers of fuller's earth taken off one by one, and spread in the sun to dry, the racks being movable, so that they can be shoved under cover in stormy weather. Thus far this fuller's earth has been used only for cleansing woolen goods, and it has been shipped to several factories in New York and neighboring states. A second mine of the same material has been opened on an adjoining farm by M. A. Penfield. The New York material has thus far not been used for clarifying purposes, and it is doubtful if the deposit from McConnellsville will prove to be suitable for this purpose.

GARNET

The mining of garnet is a well-established industry in the Adirondacks. Here are centered the mines which have over a period of more than 20 years produced 90 per cent of the total production of the United States. The mineral as mined is the common or almandite variety which is a silicate of aluminum and iron. It is found associated with hornblende-feldspar rocks as crystals from small size to

several feet across. There is a great variation in the quantity of garnet present in the various rocks, but only the best or richest portions are exploited.

The variety of garnet mined has a hardness ranging from 7.5 to 8. This is above the average for this mineral (6-7.5) and is thus intermediate between quartz (7) and corundum (9).

The garnet is mined for the most part by the usual quarry methods, crushed and concentrated for the market. Abundant hornblende is associated with the garnet, and as its specific gravity is but little greater than hornblende, difficulty attends the separation of the two, but with perfected concentrators now in use, garnet may be obtained with less than 5 per cent impurities. The association with hornblende rock or amphibolite which shows evidences of metamorphism suggests that the formation of the garnet is a result of recrystallization brought about by a metamorphic process.

The garnet has a deep reddish color and only occasionally specimens are found that approach gem quality. The large individual garnets seldom show crystal boundaries and are usually so shattered that they are readily broken to small grains. Garnet has imperfect cleavage but there is a marked tendency to parallel parting. This property gives a smooth surface for the attachment of the particles of paper and at the same time gives a good cutting edge.

Garnet is used mainly in the shoe and woodworking industries, although some of the poorer grades are sometimes mixed with emery or corundum for the making of certain grades of abrasive wheels.

At present all the active garnet mines are located in the upper Hudson valley. North Creek, the terminus of the Delaware and Hudson railroad, is the principal point of shipment. As found in the mine, the garnet forms bands and lenses in the more acid gneiss which forms the country work of the region.

The occurrence of garnet may be said to be widespread in the Adirondacks and other regions where the rock has a metamorphic character. Only seldom, however, is it found in deposits of sufficient size and richness and at the same time with the proper physical qualities to warrant commercial exploitation.

The garnet mines in the Adirondacks were first developed for commercial production in 1882. The earliest operations were on Gore mountain in connection with the remarkable mine known as the Rogers mine. The output for the first two years did not amount to

more than a few tons but in 1892 the production had grown to 1475 tons. With the introduction of mechanical methods for separation of the garnet the industry was put on a firm basis and has maintained a steady growth through a series of years.

Production of garnet in New York since 1919

YEAR	SHORT TONS	VALUE
1919.....	4 623	\$301 252
1920.....	4 276	359 425
1921.....	2 998	258 705
1922.....	6 654	546 879
1923.....	7 662	583 190
1924.....	7 428	623 472
Total.....	33 641	\$2 672 923

Production

The production of garnet from the Adirondacks during the past three years shows the flourishing condition of the industry. In 1924 the production amounted to 7428 tons valued at \$623,472. The value is the largest ever recorded. The 1923 production shows the largest tonnage amounting to 7662 with a value of \$583,190. The imports of garnet in 1923 as published by the United States Geological Survey amounted to \$93,803, tonnage not given. The table herewith given shows the tonnage and value of garnet produced in New York State since 1919.

Locations of Deposits and Operators

The North River Garnet Company, North River, N. Y., operates at Thirteenth lake. Before opening this quarry in 1905, this company operated a short distance west of North river.

H. H. Barton and Sons Company, Philadelphia, Pa., operates on Gore mountain near North Creek.

The American Glue Company, Boston, Mass., until recently operated the Crehore mine in Essex county. It is located about five miles northwest of North river on the Indian Lake road.

The Warren County Garnet Mills, Riparius, N. Y., operates a mine less than a mile west of the Hudson river. This mine is directly east of Wevertown.

In addition to the above active garnet mines a number of others have been recorded which at one time or another have produced more or less garnet. The following are located on the North Creek

quadrangle in addition to the one operated by the Warren County Garnet Mills: (1) on Oven mountain; (2) Rexford's mine one-half mile southeast of Holcombville; (3) mine on Parker farm just southwest of Daggett pond; (4) mine about three-quarters of a mile east of Fuller pond.

South of Keeseville, Essex county, a mine was operated for a few years on the slopes of Mount Bigelow near the Clinton county border.

A deposit of garnet similar to the one on Mount Bigelow has been reported from the vicinity of Mount Pokamoonshine southwest of Mount Bigelow. Near Willsboro, Essex county, garnet deposits have been recently prospected and further developments may be expected.

In St Lawrence county a garnet mine three miles north of Gouverneur was operated for a time but has not been active for a number of years.

Outside of the Adirondacks there are somewhat limited garnet deposits in the Highlands of southeastern New York and those in the vicinity of Peekskill have been worked in a small way.

References

Kemp, J. F. & Newland, D. H.

1899 N. Y. State Geol. 17th Ann. Rep't, p. 548-49. Same in N. Y. State Mus. 51st Ann. Rep't, v. 2, p. 548-49

Magnus, H. C.

1904 Abrasives of New York State. N. Y. State Geol. 23d Annual Rep't, p. 158-63

1905 Same in N. Y. State Mus. 57th Annual Rep't, v. 1, pt 1, p. 158-63

Merrill, F. J. H.

1895 Mineral Resources of New York. N. Y. State Mus. Bul. 15, p. 553-55. Same in N. Y. State Mus. 48th Annual Rep't, v. 1, p. 553-55 (2d paging)

Miller, W. J.

1914 The Garnet Deposits of Warren County, New York. N. Y. State Mus. Bul. 164, p. 95-102. Same in N. Y. State Mus. 66th Annual Rep't, v. 1, p. 95-102

Newland, D. H.

1921 Garnet. The Mineral Resources of the State of New York. N. Y. State Mus. Bul. 223-24, p. 79-85

GRAPHITE

The mining of graphite in New York State—once one of the leading states in graphite production—came to a standstill in 1921, and since that time the mines have been idle. Although no statistics may be given for the last three years during which graphite was mined, it may be stated that in 1919 the value of the graphite produced exceeded that of any other state. In 1920 New York's production stood second in value of graphite sold, although there were but two operators. In 1921 production was reported by but one firm. The suspension of graphite mining in New York is due simply to the low price of graphite, which has seriously affected the industry

throughout the United States. This is shown by the fact that in 1918, 42 operators reported production, while in 1923 there were only seven. Importations of foreign graphite at present dominate the market, and with the low prices prevailing, the outlook for an early reopening of the graphite mines is not encouraging.

In the accompanying table is given the quantity and value of graphite mined for the years since 1904, except for certain years when there were less than three producers.

The graphite mines which have yielded most of the production are found on the eastern border of the Adirondacks in a belt extending from the vicinity of Saratoga Springs on the south to west of Lake

Production of graphite in New York since 1904

YEAR	POUNDS	VALUE
1904.....	3 132 927	\$119 509
1905.....	3 897 616	142 948
1906.....	2 811 582	96 084
1907.....	2 950 000	106 951
1908.....	1 932 000	116 100
1909.....	2 342 000	140 140
1910.....	2 619 000	160 700
1911.....	2 510 000	137 750
1912.....	2 628 000	142 665
1913.....	2 250 000	112 500
1914.....	2 483 339	151 143
1915.....	2 500 000	162 000
1916.....	a	a
1917.....	2 941 040	261 548
1918.....	3 266 518	273 188
1919.....	a	a
1920.....	a	a
1921.....	a	a

a Figures can not be published, there being less than three producers.

Champlain at the north. On the northwest side of the Adirondacks a graphite mine is located at Pope Mills, St Lawrence county. In geologic occurrences the graphite deposits are found in the ancient Precambrian metamorphosed sediments known as the Grenville series.

References

Alling, Harold L.

1918 The Adirondack Graphite Deposits. N. Y. State Mus. Bul. 199, p. 1-150

Bastin, E. S.

1909 Chapter on Graphite in Mineral Resources, Calendar Year 1908. U. S. Geol. Surv., pt 2, p. 717-38

Newland, D. H.

1921 Graphite. The Mineral Resources of the State of New York. N. Y. State Mus. Bul. 223-24, p. 85-91

GYPSUM

The production of gypsum has shown a remarkable growth in the State during recent years. Since 1904 the annual output has increased from 151,455 tons to 1,474,491 tons, which represents the 1924 production.

The mining of gypsum has been carried on in New York for more than 100 years. In the early years of the industry the product was almost entirely used for agricultural purposes and sold under the name of land plaster. For many years the annual output for the purpose of land plaster was about 30,000 tons. The increased use of limestone and lime has had a tendency to curtail production of land plaster for agricultural uses.

One of the large demands for gypsum at present is for use as a retarder to delay the set of cement. For this purpose, the gypsum is often sold in a crude state directly to the cement plants. The greater part of the output, however, is calcined into stucco. The stucco in turn is either converted into wall plaster by the addition of some kind of fibre, such as hair or shredded wood, or manufactured into other types of building material, such as plaster and wall board, and blocks and tiles of various sizes and shapes. The blocks and tiles are used largely for fire-proof construction of floors, partitions and roofs.

A new use for gypsum has recently been described by Frank A. Wilder who states :

Calcined gypsum, as the cementitious material for use with an aggregate for walls poured in place, entered a new and probably an important field during 1925. Dwellings, garages and warehouses are being constructed with gypsum floors, roofs and walls properly and adequately water-proofed. Calcined gypsum in this connection has a number of advantages over portland cement. In the construction of a dwelling of average size from 20 to 30 tons of calcined gypsum may be used, whereas one-tenth of this amount is sufficient if the use of calcined gypsum is confined, as is now the custom, to the interior plastered surfaces. A considerable expansion of the industry in the production of gypsum for the above-named purpose is possible.

The gypsum deposits of New York are confined to what are known as the Camillus shales, one of the higher formations of the Salina series. Gypsum beds occur in Madison county and in the counties westward from that point, including Onondaga, Cayuga, Seneca, Ontario, Monroe, Genesee and Erie. Present activities are centered almost entirely in Monroe, Genesee and Erie counties. The great

increase in demand for gypsum at present occasions some apprehension for future supplies. If the less pure grades of gypsum, found at the east end of the district, could be utilized with advantage in a commercial way, it would greatly augment future expansion of the industry in the State.

A new deposit of gypsum was discovered during the summer of 1925 near Clarence Center, Erie county. The deposit is west of the Akron district. It is said that tests thus far made have shown the presence of 5,000,000 tons of gypsum, with possibilities that the deposit may yield 10,000,000 tons. The gypsum is reported to lie below twenty feet of soil and twenty-five feet of limestone. The gypsum is reported to be of excellent quality and occurs in a bed four feet thick. A company recently formed, known as the National Gypsum Company will mine the deposit and will manufacture plaster wall board.

An important consideration brought out rather prominently by D. H. Newland is the fact that as the gypsum beds increase in depth toward the south along the line of dip, the beds of gypsum ($\text{CaSO}_4 + 2\text{H}_2\text{O}$) gradually change to anhydrite (CaSO_4). According to Newland, the critical depth is around 250-300 feet, below which with a few exceptions only anhydrite is found. Unfortunately anhydrite can not be used for the purposes for which gypsum is employed, and thus far has been of little use commercially. Experiments are under way, however, by the United States Bureau of Mines which may result in the development of a practical process for converting anhydrite into the gypseous form. Tests on the use of anhydrite as a cement retarder have also been carried on, and the results seem to show that when mixed with gypsum satisfactory results have been obtained although it has little retarding value when used alone.

Production of gypsum in New York

YEAR	MINE OUTPUT IN SHORT TONS	VALUE
1919.....	591 153	\$3 530 743
1920.....	780 295	6 438 929
1921.....	712 665	6 410 221
1922.....	1 055 302	8 807 366
1923.....	1 361 116	10 344 745
1924.....	1 474 491	14 329 246
Total.....	5 975 022	\$49 861 250

Production of gypsum in New York

MATERIAL	1919		1920	
	SHORT TONS	VALUE	SHORT TONS	VALUE
Total mine output.....	591 153	.....	780 295	.....
Sold crude.....	210 959	\$596 355	255 567	\$919 641
Ground for land plaster....	5 458	23 984	15 510	67 862
Wall plaster, etc.....	316 767	2 910 404	387 856	5 451 426
Total.....	.....	\$3 530 743	.....	\$6 438 929

Production of gypsum in New York

MATERIAL	1921		1922	
	SHORT TONS	VALUE	SHORT TONS	VALUE
Total mine output.....	712 665	.....	1 055 302	.....
Sold crude.....	186 223	\$610 235	267 822	\$801 848
Ground for land plaster....	20 081	84 283	13 708	49 537
Wall plaster, etc.....	418 695	5 715 703	631 735	7 955 981
Total.....	.....	\$6 410 221	.....	\$8 807 366
MATERIAL	1923		1924	
	SHORT TONS	VALUE	SHORT TONS	VALUE
Total mine output.....	1 361 116	.....	1 474 491	.....
Sold crude.....	228 831	\$712 093	334 766	\$977 286
Ground for land plaster....	1 249	5 906	1 075	5 491
Wall plaster, etc.....	823 241	9 626 746	1 019 319	13 346 469
Total.....	.....	\$10 344 745	.....	\$14 329 246

The companies reporting production of gypsum in 1924 were the following, operating in Monroe, Genesee and Erie counties:

OPERATOR	ADDRESS	LOCATION OF MINE
Beaver Products Co. Inc.	Buffalo, N. Y.	Akron, Erie county
Universal Gypsum Co.	Chicago, Ill.	Akron, Erie county, also owns lease in Genesee county
Niagara Gypsum Co.	Buffalo, N. Y.	Oakfield, Genesee county
Oakfield Gypsum Products Corporation.	Oakfield, N. Y.	Alabama, Genesee county
United States Gypsum Co.	Chicago, Ill.	Oakfield, Genesee county
Phoenix Gypsum Co.	Basom, N. Y.	Alabama, Genesee county
Ebsary Gypsum Co., Inc.	Scottsville, N. Y.	Wheatland, Monroe county
Empire Gypsum Co.	Rochester, N. Y.	Garbutt, Monroe county
Lycoming Calcining Co.	Williamsport, Pa.	Garbutt, Monroe county

The production of gypsum in the State since 1919 is given in the above table, which includes both mine output in tons and values. Additional tables giving the tonnages and values of gypsum for the 1919-24 period, together with the purposes for which the gypsum was used, are also presented.

References

- Luther, D. D.**
1898 Economic Geology of Onondaga County. N. Y. State Mus. 49th Ann. Rep't, v. 2, p. 237-303
- Merrill, F. J. H.**
1893 Salt and Gypsum Industries of New York. N. Y. State Mus. Bul. 11, p. 1-89
- Newland, D. H.**
1921 Gypsum. The Mineral Resources of the State of New York. N. Y. State Mus. Bul. 223-24, p. 91-101
1921a Relation of Gypsum Supplies to Mining. Issued with Mining and Metallurgy, Sept. 1921. No. 1094-M, p. 1-10
- Newland, D. H. & Leighton, H.**
1910 Gypsum Deposits of New York. N. Y. State Mus. Bul. 143, p. 1-94
- Parsons, Arthur L.**
1902 Recent Developments in the Gypsum Industry in New York State. N. Y. State Mus. Rep't 54, v. 1, p. 1177-1183
1904 Notes on the Gypsum Industry of New York. N. Y. State Geol. 23d Ann. Rep't, p. 89-157
- Wilder, Frank A.**
1926 Engineering and Mining Journal-Press, Jan. 16, 1926, p. 99

IRON ORE

Iron ore is by far the most important metallic mineral mined within the State. The industry of iron mining dates from early colonial days. Limonite was mined as early as 1750 in Dutchess county and even earlier in Columbia county. The year 1750 also saw the beginning of the mining of magnetite in the Highlands of the Hudson. Among the mines opened for magnetite were the famous Sterling mines in southern Orange county, which up to June 1923 were operated almost continuously. A furnace was erected at the Sterling

mines in 1751 and the iron made there was used in supplying the needs of the American Army during the Revolutionary War. Another magnetite mine in the Highlands back of West Point, known as the Forest of Dean mine, was opened about 1756 and is still being operated. The magnetite ores of the Adirondacks were first mined about 1800. The earliest operations were in the Champlain valley and soon after many mines were opened and local furnaces established at various points in the Adirondacks.

Magnetite

The magnetite deposits of the State are confined to the Precambrian areas of the Adirondacks and the Highlands of the Hudson. Magnetites are black ores and are attracted by the magnet. This property of the ore is made use of in the magnetic separator which makes possible shipments free from rock material. Magnetite when pure contains 72.4 per cent of iron and 27.6 per cent of oxygen, the iron content being the highest percentage of any iron ore. In fact, some of the shipments from the Adirondacks have been notable for their high iron content, approaching closely the theoretical limit.

Production of iron ore in New York State since 1919

YEAR	MAGNETITE IN LONG TONS	HEMATITE IN LONG TONS	TOTAL IN LONG TONS	TOTAL VALUE
1919.....	666 176	44 150	710 326	\$4 037 225
1920.....	950 537	22 372	972 909	6 321 999
1921.....	174 368	2 445	176 813	961 477
1922.....	191 195	14 769	205 964	1 163 040
1923.....	722 096	12 849	734 945	3 320 004
1924.....	303 386	12 966	316 352	1 512 571
Total.....	3 007 758	109 551	3 117 309	\$17 316 316

The most productive group of mines in the Adirondacks are those located at Mineville. These mines include what is known as the 21-Joker-Bonanza group, the Harmony deposits at the west of the first-named group, the Barton hill mines, the Smith mine to the east of Fisher hill and the Sherman mine one-half mile north of the Smith mine.

East of Mineville near the shore of Lake Champlain, two miles north of Port Henry, is the Cheever mine, the oldest in the region. Two other mines in the district are known as the Pilfershire and Lee mines, but these have not been operated in many years.

In Clinton county, to the north and east of Ausable Forks, is a group of magnetite deposits, one of the largest in the Adirondacks, which is made up of several belts—the Cook hill group, the Arnold hill group, the Palmer hill, Jackson hill and other ore bodies farther north.

In the Saranac valley are located a number of magnetite mines which formerly were actively operated, but at present the only active operations are on Lyon mountain, where operations are conducted by the Chateaugay Ore and Iron Company. On the western side of the Adirondacks two well-known mines are the Benson and Clifton mines in St Lawrence county. Other mines and deposits of magnetite are located in St Lawrence county, but none of the mines of the county has been worked for a number of years.

Hematite

The main deposits of hematite (Fe_2O_3 , iron=70 per cent, oxygen=30 per cent) in the State occur in two separate regions and under widely different geological conditions. One of the regions is in St Lawrence and Jefferson counties where hematite occurs associated with Precambrian (Grenville) limestones and schists. In several localities hematite is found directly below the Potsdam sandstone, which formation when present overlies the Precambrian of this district. The Jefferson and St Lawrence county hematite ores occur in a few narrow belts which extend in a northeast-southwest direction through the towns of Antwerp and Theresa, Jefferson county, and Gouverneur, Rossie, Hammond, Macomb, Fowler, Edwards, Hermon, DeKalb and Canton, St Lawrence county. The total output of the mines has been estimated at about 2,500,000 tons. During the past few years none of the mines has been active.

The most important hematite deposits in the State are found in the sedimentary rocks of the Clinton formation. The Clinton beds of the State do not everywhere contain iron ore beds but in the stretch between Herkimer county on the east and Monroe county on the west, a distance of about 120 miles, one or more beds of iron ore are present. In the eastern part of the belt the ore has been extensively worked in the vicinity of Clinton, Oneida county. The ore bed mined at Clinton is of the oolitic variety. There is also present a higher bed of fossil ore that has not been mined, owing to its low iron content. Further west between Clinton and Verona there are a number of old workings, and at Sterling Station, Cayuga county, the hematite is being mined for paint ore. In Wayne county near the

western end of the belt the only mine at present operated is at Fruitland in the town of Ontario, where fossil ore is obtained for paint purposes.

In addition to the magnetite and hematite deposits, there are deposits of limonite and carbonate of iron in Dutchess and Columbia counties. Deposits of limonite also occur on Staten Island and at the Townsend iron mine near Idlewild, Orange county. At the Orange county locality the limonite is associated with Devonian limestone formations. None of the limonite ores of the State has been mined since 1917, and the last production of carbonate ores was in 1901.

Production or shipments of iron ore in 1924 was reported by the following firms:

NAME AND ADDRESS OF OPERATOR	NAME OF MINE	LOCATION OF MINE
<i>Magnetite</i>		
Fort Montgomery Iron Corp., 20 Vesey street, New York.	Forest of Dean....	Fort Montgomery, Orange county
Chateaugay Ore & Iron Co., 26 Liberty street, New York.....	Chateaugay.....	Lyon Mountain, Clinton county
Port Henry Iron Ore Co., 2 Rector street, New York	Fisher & No. 21....	Mineville, Essex county
Witherbee, Sherman & Co., S. Main street, Port Henry	New Bed (Barton Hill), Harmony, Old Bed, Sherman, Smith & Cheever.	Mineville, Essex County
<i>Hematite</i>		
Clinton Hematite Mines, Clinton	Clinton Hematite Mines	Clinton, Oneida county
Clinton Metallic Paint Co., Clinton	Franklin.....	Clinton, Oneida county
Fruitland Iron Ore Co., 640 N. 13th street, Easton, Pa.	.....	Ontario (Fruitland), Wayne county

In addition to the above the hematite mine located at Sterling Station, Cayuga county, was reopened for the production of paint ore in 1925 by Stanley Doggett, Inc., 99 John & 11-13 Cliff street, New York.

References

- Beck, Lewis C.**
1842 Mineralogy of New York, p. 1-445
- Colony, R. J.**
1923 The Magnetite Iron Deposits of Southeastern New York. N. Y. State Mus. Bul. 249-50, p. 1-161
- Eckel, Edwin C.**
1905 Limonite Deposits of Eastern New York and Western New England. U. S. Geol. Surv. Bul. 260, p. 335-42

- Emmons, Ebenezer**
1842 Geology of New York. Report on the 2d Dist. p. 1-427
- Hall, James**
1843 Geology of New York. Report on the 4th Dist., p. 1-675
- Kemp, J. F.**
1898. The Geology of the Magnetites near Port Henry, N. Y., and especially those of Mineville. Amer. Inst. Min. Eng. Trans., v. 27, p. 146-203
1899 Titaniferous Iron Ores of the Adirondacks. U. S. Geol. Sur. 19th Ann. Rep't, Part 3, p. 377-422
1910 Geology of the Elizabethtown and Port Henry Quadrangles. N. Y. State Mus. Bul. 138, p. 97-149
- Koeberlin, F. R.**
1909 The Brewster Iron Bearing District of New York. Economic Geol., v. 4, Dec. 1909, p. 713-54
- Nason, F. L.**
1893 Notes on Some of the Iron Bearing Rocks of the Adirondack Mountains. Amer. Geol., v. 12, July 1893, p. 25-31
1922 The Importance of the Iron Ores of the Adirondack Region. Year Book of the American Iron and Steel Institute, p. 168-207
- Newland, D. H.**
1907 On the Associations and Origin of the Nontitaniferous Magnetites in the Adirondack Region. Economic Geol., v. 2, Dec. 1907, p. 763-73
1908 Geology of the Adirondack Magnetic Iron Ores, with a Report on the Mineville-Port Henry Group, by J. F. Kemp. N. Y. State Mus. Bul. 119, p. 1-182
1921 Iron Ore. The Mineral Resources of the State of New York. N. Y. State Mus. Bul. 223-24, p. 101-40
- Newland, D. H. & Hartnagel, C. A.**
1908 Iron Ores of the Clinton Formation in New York State. N. Y. State Mus. Bul. 123, p. 1-76
- Putnam, B. F.**
1886 Notes on the Samples of Iron Ores Collected in New York. Reports of the Tenth Census, v. 15, p. 89-144
- Smock, J. C.**
1889 First Report on the Iron Mines and Iron-Ore Districts in the State of New York. N. Y. State Mus. Bul. 7, p. 1-67
- Smyth, C. H. jr**
1892 On the Clinton Iron Ore. Amer. Jour. Sci., v. 43, p. 487-96
1894 Report on the Geology of Four Townships in St Lawrence and Jefferson Counties. N. Y. State Mus. 47th Ann. Rep't, p. 685-709
- Wendt, A. F.**
1884 The Iron Mines of Putnam County, New York. Amer. Inst. Min. Eng. Trans., v. 13, p. 478-88
- Witherbee, F. S.**
1916 The Iron Ores of the Adirondack Region. Year Book of the American Iron and Steel Institute, p. 328-47

LEAD

Galena (PbS), the chief source of lead, has been mined in the State at various times during the past 100 years. At present there are no active mines. The last production reported was in 1918 when

one of the mines in the Shawangunk mountain district produced 29 short tons of lead valued at \$4161, together with 129 ounces (Troy) of silver. In a number of occurrences the galena is associated with the zinc ores to which further reference is given under zinc. In St Lawrence county lead mines have been worked in the towns of Rossie and Macomb; also west of St Lawrence county in the town of Alexandria, Jefferson county. The galena is here found in veins with calcite as a gangue. Most of the veins are in Precambrian gneiss but some of the veins extend into the overlying Potsdam sandstone. In several of the lead veins about Rossie, cerussite, the carbonate of lead, is found associated with the galena. In the Shawangunk mountain region lead mines have been operated either for lead alone or for lead and zinc at Ellenville, Summitville, Spring Glen and at two localities near Guymard. All the mines here are in the Shawangunk grit or conglomerate, which is of Silurian age. In Columbia county galena occurs at a number of places and was once mined at a locality known as the Ancram Lead Mines. A number of additional occurrences of galena have been recorded in various sections of the State. These include Smithfield, Dutchess county; Ossining, Westchester county; White Creek, Washington county; Sprakers Basin, Montgomery county; also in Lewis, Oneida and Monroe counties.

References

Beck, Lewis C.

1842 Mineralogy of New York, p. 44-52

Emmons, Ebenezer

1842 Geology of New York. Report on the 2d Dist., p. 354-60

Mather, W. W.

1843 Geology of New York. Report on 1st Dist., p. 1-653

Newland, D. H.

1921 Lead. The Mineral Resources of the State of New York. N. Y. State Museum Bul. 223-24, p. 140-43

Smyth, C. H. jr

1903 The Rossie Lead Veins. School of Mines Quarterly, (Columbia University), July 1903, p. 421-29

Whitlock, H. P.

1904 Minerals not Commercially Important. N. Y. State Geol. 23d Ann. Rep't, p. 184-85

MARL

Marl is a form of unconsolidated limestone. In its areal distribution, mode of occurrence and physical characters, it differs widely from the hard limestones. It is its chemical composition alone which makes the use of marl possible for a number of purposes in place of

limestone. The unconsolidated character of the marl deposits is due to their having been formed largely during the Quaternary period and their not having been subjected to conditions favorable to consolidation as have the limestones of older geological ages.

The deposits of marl are found mainly in swampy areas and often in association with beds of peat, clay and sand. The peat beds when present overlie the marl. The chief impurities of marl as mined consist of small amounts of sand and clay. The origin of marl is brought about in bodies of water by tributary streams holding lime and carbon dioxide in solution. The lime is precipitated through loss of the carbon dioxide held in solution, which process is greatly aided by evaporation of the water and increased temperature. In some cases deposition takes place directly along streams or at springs. Under such circumstances living plants, such as algae, rob the water of carbon dioxide, thus causing a deposition of the lime, encrusting and inclosing the plant remains. Deposits of this nature are known as calcareous tufa or travertine. They are more compact than marl and a number of deposits of the State are of sufficient size for quarrying and to a small extent the deposits have been worked.

Occurrence

Marl deposits have been reported from nearly every county of the State. The more important deposits, however, are found in central and western New York. South of Oneida lake, Cowaselon swamp contains several thousand acres of marl, in most cases overlain by peat. The maximum thickness reported is 30 feet. In Onondaga county marl has been reported in the swamps in the towns of Fabius, Tully, Camillus, DeWitt, Manlius, Elbridge and VanBuren. West of Syracuse at Warners the Empire Portland Cement Company formerly excavated marl for the purpose of cement-making. The American Portland Cement Company also worked a marl deposit west of Warners near Jordan. Both the cement plants were dismantled some years ago.

The use of marl for cement-making has not proved practical although the content of lime carbonate is above 90 per cent. Marl when freshly dug has a large moisture content often equal in weight to that of the marl itself. The cost of handling this dead weight and the expense involved in drying and briquetting the marl before it is ready for the kiln has led to the abandonment of all the portland cement plants using marl as a raw material.

In Cayuga and Seneca counties the Montezuma marshes contain large deposits of marl. In Wayne county some large deposits are found in the southeast portion and many beds have been reported from various towns in the county. In the southern part of Monroe county marl has been reported at several localities. Near Caledonia, Livingston county, the Iroquois Portland Cement Company formerly utilized the marl at that place. In Genesee county deposits of marl occur near Bergen, LeRoy and Batavia. Marl is also reported from Silver lake in Wyoming county. In Chautauqua county deposits are found at Cassadaga lake and along the southern end of Chautauqua lake. In Steuben county there are numerous beds of marl and calcareous tufa. The marl beds of this county formerly furnished material for two portland cement plants. In the Mohawk valley marl has been reported from near Canajoharie, Fort Plain and Fonda. In the Hudson valley some of the most important marl deposits are found in Saratoga, Columbia, Albany, Greene, Dutchess and Orange counties. At the present time the production of marl on a commercial scale in New York State is very limited. In 1924 production was reported by but one firm. This was the Bone Dry Limestone Corporation, Dunkirk, N. Y.

References

Marshall, W. P.

1892 Report on Deposits of Marl and Peat in the Town of New Baltimore, Greene county. N. Y. State Mus. 45th Ann. Rep't, p. 45-52

Ries, H. & Eckel, E. C.

1901 Lime and Cement Industries of New York. N. Y. State Mus. Bul. 44, p. 641-968

Newland, D. H.

1921 Marl. The Mineral Resources of the State of New York. N. Y. State Mus. Bul. 223-24. p. 145-49

MICA

The commercial production of mica in New York has never become a settled industry. Many prospects and mines have been opened up in various sections of the Adirondacks and the Highlands of the Hudson. Small amounts have been mined from time to time either alone or in connection with other minerals such as feldspar and quartz, the association of these three minerals in pegmatite veins having made possible the production of mica as a secondary product. The mining of mica is attended with certain technical difficulties and operations for the most part must be on a small scale, since modern labor saving devices can not well be used to advantage. The cost of mining operations is therefore largely dependent on labor conditions.

Several varieties of mica occur in the State. The important ones from a commercial point of view are muscovite, biotite and phlogopite. All three kinds have been mined. Muscovite is also at times called white mica in allusion to its transparency. Certain deposits, however, have a dark color and in this respect closely resemble biotite. Biotite usually has a dark brown color and is transparent only in very thin sheets. Phlogopite is usually yellow or amber in color but occurs at some localities with a reddish or greenish tinge. Small flakes of yellow mica when mixed with other material such as sand are frequently mistaken for gold.

Mica serves a variety of uses. As sheet mica it is employed extensively in the electrical industry for such uses as insulators, in fuse boxes, for spark plugs, telephones and for washers and discs in electrical machinery. Sheet mica is also used for glazing stove fronts, for furnace sights, lamp chimneys, goggles, in windows, and in lantern transparencies. Ground mica is used in paints, for decoration in wall paper, ornamental tiles, for artificial stone, in pipe and boiler coverings, as patent roofing material and as a filler in various manufactured products. Mica also forms the basis of a number of products sold under trade names such as micalite, micanite, micabeston, micabond and rimco.

Among the localities in the State where deposits of mica have been recorded are the following: Batchellerville, Saratoga county; Crown Point and Ticonderoga, Essex county; Orange county, near Lake Mombasha in town of Monroe and near Greenwood lake, eight miles southwest of Warwick, near Chestertown, Warren county; Jefferson county, near Henderson and Muscalonge lake in the town of Theresa. In St Lawrence county mica was mined near Oswegatchie until 1923 when the mine was taken over by a water power development company and the mine was flooded. Other mica deposits in St Lawrence county include those at Somerville and at Edwards.

MILLSTONES

Millstones are produced in New York, Virginia, North Carolina, Pennsylvania and Alabama. The market for millstones has been curtailed for some years because of the introduction of superior forms of grinding machinery, such as rolls and ball mills. In former years the annual production of millstones in New York alone often exceeded \$100,000. Since 1888 the value of the annual production of millstones in the United States has been less than this amount.

The table herewith given shows the production of millstones in New York during recent years. Handmade millstones are still being produced for some corn and mustard mills in the South. Millstones are also used by manufacturers of cement and talc and for grinding quartz, feldspar, barytes and mineral paint.

Production of millstones since 1919	
YEAR	VALUE
1919.....	\$10 155
1920.....	13 331
1921.....	14 672
1922.....	17 025
1923.....	10 344
1924.....	18 215
Total	<u>\$83 742</u>

In New York the raw material for millstones is obtained in Ulster county, the trade term for millstones being Esopus stone. Esopus is an early name for Kingston, which was formerly the main point of shipment. The material for millstones is quarried from the Shawangunk conglomerate which is found near the western base of the Shawangunk mountain. The district from which the millstones are obtained is somewhat restricted, being confined to the region extending from near High Falls on the north to Kerhonkson on the south, approximately a distance of 10 miles.

The methods employed in quarrying the stone are simple. The stone is split, advantage being taken of joints and bedding planes. Tools used are the common hand drill together with blocks, and sometimes blasting is employed but with light charges of powder. The rough stones thus obtained are dressed and finished by hand methods, the chief tools being the bull point and hammer. Drilling the "eye" is performed by centering the stone and then drilling from the center of both faces. In many millstones the eye is square. In making a square eye, a round hole is first drilled and then squared off.

In stones used for grinding paint there is a modification from the ordinary millstone. For this particular use the stone is cut in halves and an iron casting is placed between the halves which are then joined together by an iron band.

Chasers as a rule are larger than the regular millstones. They run on edge; that is, they have horizontal shafts. They have a grinding distance from about two feet to seven feet with a diameter of as much as 22 inches. These chasers are run on pans paved with blocks

often of the same material as the chasers. The following persons or firms are producers of millstones, all in Ulster county.

NAME	POSTOFFICE
E. D. Coddington.....	Accord
Frank Coddington.....	Accord
Joachim Coddington.....	Accord
Lester Coddington.....	Accord
Q. D. Coddington.....	Accord
W. Davenport.....	Accord
J. S. Depuy.....	Accord
Harry Laurence.....	Accord
Lange Brothers.....	Accord
Asa Purcell.....	Alligerville
David Purcell.....	Alligerville
Ross Schoonmaker.....	Alligerville
W. C. Addis Stone Company.....	Granite
Arthur Rose.....	Granite
Wilfred Coddington.....	High Falls
Esopus Millstone Company, C. Schoonmaker, Manager	High Falls
William Countryman.....	Kerhonkson, R. F. D.
Floyd Decker.....	Kerhonkson
Miles Decker.....	Kerhonkson
Bruyn Hasbrouck.....	New Paltz

MINERAL PAINT

Only natural mineral materials, which in their preparation require merely washing or grinding and in some cases calcination to improve their color, will be considered here. These include such materials as iron ore, shale, slate and ochers. Lead and zinc pigments are not included, for, while manufactured in the State, their manufacture requires elaborate chemical operations, and besides most of the zinc and all of the lead so utilized is obtained from without the State.

The most important source of mineral paint in the State is the Clinton hematite, an ore which was also formerly worked extensively for its iron. During the past few years all hematite ore mined has been used for paint purposes. The annual output is given in the table showing production of iron ore.

At present iron ore for paint is produced at two mines at Clinton, Oneida county, one at Sterling Station, Cayuga county, and one at Fruitland, Wayne county. Both the oolitic and fossil ores are mined for paint purposes. In the red hematite belt of Jefferson-St Lawrence counties, considerable mineral paint was produced before the closing down of the mines. The ore here is without fossil or oolitic structure but is finely divided, and the softer ores yield an excellent paint material. Carbonate and limonite ores, suitable for metallic paint, occur in southeastern New York, but none is mined at present. The carbonate gives a red color which is brought out by calcination and the limonite a natural brownish yellow color.

Certain shales and slates by reason of the iron oxides which they contain and also because of their suitability for grinding are made into mineral paints. The Cambrian slates of Washington county yield a variety of tints. The ground slate is also used for prepared roofing and for mortar colors. Deposits of Devonian shale were formerly mined for paint at Roxbury, Delaware county, and near Randolph, Cattaraugus county. The Vernon red shales of the Salina formation have been worked for paint in Herkimer county, and in Ulster county the red shale overlying the Shawangunk grit has also been the source of paint material.

Ochers are of rare occurrence in the State. They are formed by the surface weathering of iron-bearing rocks, but in most places the deposits have been swept away by glacial action. A deposit of ocher located in a depression on Crane mountain, Warren county, was worked a number of years ago. Ocherous clays are found associated with some of the limonite deposits of Columbia and Dutchess counties, but there is no record that they have been used for paint purposes.

MINERAL WATERS

The commercial production of natural mineral and potable spring and well waters constitutes a large and important industry of the State. In addition to the direct revenue received from the sales of spring waters, a large indirect income is received at the tourist and health resorts which have grown up around mineral springs, such as Saratoga Springs, Richfield Springs, Sharon Springs and Clifton Springs. In tables of production and values, only the waters actually sold are taken into account. The values of waters used at health resorts, such as bathing establishments, or waters given away at any of the springs are not included. Neither are distilled waters included, nor those that have been modified in character, such as "soft drinks" made of spring waters. In some cases, however, certain quantities of spring water sold to manufacturers of soft drinks are included at the spring water prices. For the most part, the production covered by the statistics represents the natural waters as they come from the spring and are sold locally or shipped. The waters are usually sold in bottles, carboys or tanks, and the prices, which are exclusive of the containers, represent those at the spring or point of shipment.

Most of the spring water sold in the State is reported either as table or medicinal water. The distinction is, however, more or less arbitrary, and water from some springs is used for bath, table and medicinal purposes. Table waters, as a rule, are clear, sparkling and

without any mineral taste or odor; many mineral waters are highly mineralized and have a distinct taste and odor. Certain table waters, nevertheless, are more highly mineralized than some medicinal waters, and the latter may contain less mineral matter than some municipal water supplies.

Production of mineral water in New York since 1904

YEAR	PRODUCTION IN GALLONS	VALUE
1904.....	8 000 000	\$1 000 000
1905.....	8 000 000	1 000 000
1906.....	8 000 000	1 000 000
1907.....	8 000 000	1 000 000
1908.....	8 007 092	877 648
1909.....	9 019 490	857 342
1910.....	8 432 672	675 034
1911.....	8 923 628	756 147
1912.....	9 682 447	760 847
1913.....	9 448 348	806 298
1914.....	8 480 669	769 932
1915.....	8 636 920	745 530
1916.....	7 746 490	697 650
1917.....	7 819 314	562 874
1918.....	5 887 746	566 910
1919.....	6 537 966	815 615
1920.....	5 242 047	671 066
1921.....	5 965 049	736 173
1922.....	6 965 638	800 831
1923.....	6 716 154	803 433
1924.....	6 789 182	811 465
Total.....	172 300 852	\$16 714 795

The canvass of the mineral water industry is attended with considerable difficulty. A large number of the springs are employed only intermittently or on a small scale and no accurate account is kept of sales. For the most part the statistics presented herewith represent the production of those springs only which have had a regularly established business over a period of years and the totals therefore fall considerably short of the actual output of spring waters. The springs reporting production in 1923 are given below:

NAME AND ADDRESS	NAME OF SPRING	LOCATION OF SPRING
Arlington Water Company, Arlington.....		Arlington, Dutchess county
R. D. 1, Poughkeepsie		
Fred O. Baldwin, Cayuga...	Baldwin Mineral....	Cayuga, Cayuga county
Biochemic Natural Mineral Water Company, James-town	Biochemic.....	Jamestown, Chautauqua county
Breesport Mineral Water Co., Breesport	Breesport Oxygenated Mineral Spring	Breesport, Chemung county

NAME AND ADDRESS	NAME OF SPRING	LOCATION OF SPRING
George Flanders, R. D. 2, Carrier..... Potsdam	Carrier.....	Potsdam, St Lawrence county
Cascadian Products Corp., Grand View via., Nyack	Cascadian.....	Grand View (Nyack), Rock- land county
Chemung Spring Water Co., Chemung	Chemung.....	Chemung, Chemung county
Chester Crest, P. O. Box 472, Mount Vernon	Chester Crest.....	Mount Vernon, Westchester county
Mrs Mary A. Coates, Franklin Springs	Clinton Lithia Spring.	Franklin Springs, Oneida county
W. H. Stephenson, Whites- boro	Crystalate Spring....	Whitestown, Oneida county
Dietade Min. Spring Co., Inc., Keeseville	Dietade.....	Keeseville, Essex county
Vermont Spring Water Co., Inc., 40 Beaver street, Albany	Mammoth.....	North Greenbush, Rensselaer county
Mohawk Spring Water Co., 37 Henrietta street, Ams- terdam	Mohawk.....	Amsterdam, Montgomery county
Morgan Spring Water Co., R. D. 1, Rensselaer	Morgan.....	Rensselaer, Rensselaer county
Questover Spring Water Co., Inc., Moores Mills	Questover.....	Moores Mills, Dutchess county
Risley Spring Water Co., R. D., Whitesboro	Risley Cold Springs..	New York Mills, Oneida county
Saratoga State Waters Corp. Saratoga Springs	State Seal, Coesa, Geyser, Hawthorne	Saratoga Springs, Saratoga county
Saratoga Vichy Spring Co., 349 Broadway, Saratoga Springs	Saratoga Vichy and Victoria 2	Saratoga Springs, Saratoga county
J. W. Peschette, Ballston Spa	Sans Souci.....	Ballston Spa, Saratoga county
Sparkling Spring Water Co., 124 Chester street, Buffalo	Sparkling.....	Buffalo, Erie county
Arthur C. Suppe, Franklin Springs	Split Rock.....	Franklin Springs, Oneida county
Standard Spring Water Co., Troy	Standard.....	Troy, Rensselaer county
H. S. Jenner, 56 Windsor street, Rochester	Table Rock Mineral.	Mendon, Monroe county
Taconic Springs Corp., 81 Franklin street, New York	Taconic.....	Beacon, Dutchess county
Trespur Water Co., McGraw	Trespur.....	McGraw, Cortland county
Batavia Pure Ice & Storage Company, Batavia	White Bear.....	Stafford, Genesee county
Eagle Spring Water Co., Inc., 245 W. 19th street, New York	Eagle Spring.....	Lanesville, Greene county
C. J. Lord, 298 Hoosick street, Troy	Quaker.....	West Sand Lake, Rensselaer county
Frontenac Crystal Springs Co., Inc., R. D. 3, Clayton	Frontenac Crystal...	Clayton, Jefferson county
White Sulphur Springs Co., Sharon Springs	Gardner White Sulphur Springs	Sharon Springs, Schoharie county
Arthur Jones, Yorkville....	Glen Alex.....	Washington Mills, Oneida county
Gramatan Springs Co., Inc., 99 S. Boulevard, N. Y.	Gramatan.....	Bronxville, Westchester county
Granite Springs Estates, Granite Springs	Granite Springs....	Granite Springs, Westchester county

NAME AND ADDRESS	NAME OF SPRING	LOCATION OF SPRING
Great Bear Spring Co., 227 Fulton street, New York	Great Bear.....	Fulton, Oswego county
Mrs R. P. Brewer, R. D. 2, Hudson	Greendale Crystal Springs	Greendale, Columbia county
J. W. & W. N. Sowle, Ballston Spa	Hides-Franklin.....	Ballston Spa, Saratoga county
Mammoth Spring Co., 40 Beaver street, Albany	Mammoth.....	West Sand Lake, Rensselaer county
Jubilee Spring Water Co., Inc., 1391 Delaware avenue, Buffalo	Jubilee.....	Buffalo, Erie county

References

- Kemp, James F.**
1912 The Mineral Springs of Saratoga. N. Y. State Mus. Bul. 159. p. 1-80
- Newland, D. H.**
1921 Mineral Waters. The Mineral Resources of the State of New York. N. Y. State Mus. Bul. 223-24, p. 158-62.
- Peale, Albert C.**
1894 Natural Mineral Waters of the United States. U. S. Geol. Surv. 14th Ann. Rep't, Part 2, p. 49-88

NATURAL GAS

Natural gas has been produced in New York State for more than 100 years. It was not, however, until about 1864, following the discovery of oil in southwestern New York, that extensive and systematic exploration of the gas resources of the State was undertaken. The production of natural gas in New York reached its peak in the year 1914 after having shown a steady annual increase for 18 years 1897-1914. Since then production has gradually decreased from 8,714,681 M cubic feet in 1914 to 6,196,000 M cubic feet in 1924. In addition to the natural gas produced in the State about 10,000,000 M cubic feet are received annually from Pennsylvania. In 1923 there were more than 197,000 domestic and industrial consumers of natural gas in the State. This is an increase of more than 23,000 over the number of consumers of the previous year. With the ever-increasing demand for natural gas and the gradual exhaustion of the present producing gas pools it is evident that new supplies must be found if the industry is to be maintained anywhere near its present position. The possible exhaustion or curtailment of supplies from Pennsylvania is also a factor which must be taken into account.

At present about 20 gas pools have been developed in the State. These are found from near the east end of Lake Ontario in Oswego county to Lake Erie at the west end of the State. Approximately 1900 wells are productive and in addition a large number of nonproductive or dry wells have been recorded. In that part of the State lying east of the small gas pools in Oswego county no gas pools have

been developed although a number of test wells have been drilled. In nearly every instance, however, the amount of gas found did not warrant further drilling of wells.

The Trenton limestone is the lowest formation in the State from which natural gas has been obtained in quantity. Gas from this formation has been obtained in Oswego, Onondaga, Erie and Niagara counties. The Medina sandstone is the most prolific gas-bearing formation in the State and the more important gas production in Cattaraugus, Chautauqua, Erie, Genesee, Livingston, Monroe, Ontario and Wyoming counties is obtained from this formation. In Cattaraugus and Erie counties the Onondaga limestone and the Salina waterlime produce gas. The Marcellus shale yields gas in Cattaraugus, Erie, Livingston and Ontario counties. In Chautauqua, Allegany and Steuben counties gas is found in the Chemung and Portage sandstones. In these counties gas is produced from many of the oil wells but in addition to the gas thus obtained, it is also found in these counties outside the limits of the oil-producing territory.

In the table presented herewith are given the production and value of natural gas since 1919 together with the reported number of producing wells for those years when records were available. The number of wells are exclusive of those which produce oil as well as gas.

Production of natural gas in New York since 1918

YEAR	NUMBER OF WELLS	PRODUCTION IN M CUBIC FEET	VALUE
1918.....	2 114	8 460 583	\$2 820 000
1919.....	1 961	8 124 000	2 870 000
1920.....	1 972	8 419 000	3 195 000
1921.....	1 949	6 583 000	2 798 000
1922.....		6 947 145	3 379 000
1923.....		6 497 000	3 739 000
1924.....		6 196 000	3 632 000
Total.....		51 226 728	\$22 433 000

References

Ashburner, C. A.

1888 Petroleum and Natural Gas in New York State. Amer. Inst. Min. Eng. Trans., v. 16, p. 906-59; Author's Edition, 1888 p. 1-54

Bishop, I. P.

1899 Petroleum and Natural Gas in Western New York. N. Y. State Mus. Ann. Rep't 51, v. 2, p. 9-63

1901 Oil and Gas in Southwestern New York. N. Y. State Mus. Ann. Rep't 53, v. 1, p. 1105-1134

Newland, D. H.

1921 Natural Gas. The Mineral Resources of the State of New York.
N. Y. State Mus. Bul. 223-24, p. 165-97

Orton, Edward

1899 Petroleum and Natural Gas in New York. N. Y. State Mus. Bul.
30, p. 395-526

NATURAL GAS GASOLINE

The production of natural gas gasoline from natural gas is a development of the present century. Experiments on the extraction of this form of gasoline were under way in the eastern states as early as 1900. Between 1905 and 1908 further experimental work on methods of extraction was carried on at several points in Pennsylvania and at Bolivar, N. Y. The establishment of the industry on a commercial basis dates from 1909.

Natural gas gasoline is sometimes known simply as gasoline from natural gas, and the term may include the natural, unmanufactured product known as "drip" gasoline. The latter, which is often formed in the gas pipe lines, results from the condensation of the gasoline vapor contained in natural gas.

Natural gas gasoline may be manufactured from any natural gas that contains gasoline vapor. Gas issuing from oil wells usually contains considerable gasoline and is then referred to as a "wet" gas. Gas from an oil well is known also as casinghead gas and the gasoline product is sometimes called casinghead gasoline. As contrasted with the term "wet gas," the name "dry" gas is applied to natural gas that has but a small gasoline content. The terms "wet gas" and "dry gas" are, however, merely relative, and a natural gas that would be called wet in one field might be called dry in another. In some districts natural gas containing more than a gallon of gasoline to 1000 feet of gas is called a wet gas. In practical operations the amount of gasoline obtained varies from a fraction of a gallon to about five gallons from 1000 feet of gas. Various processes are employed for the recovery of the gasoline. The compression method is the one most generally employed, but for the "dry" gases the absorption method is widely used. Recently a charcoal process has been introduced for obtaining gasoline from natural gas and undoubtedly its use will be quite general in the near future.

The gasoline produced directly from natural gas and without any further treatment is known as raw or unblended gasoline. The raw gasoline is highly volatile and before being marketed for a motor fuel is blended with naphtha or other distillate, thus making possible a high-grade commercial gasoline. Of the total output of gasoline in the

United States about 11 per cent (1923) is natural gas gasoline, the rest being obtained from petroleum. The gasoline obtained by distillation of crude petroleum is called "straight-run" gasoline; that obtained by decomposition of heavy petroleum fractions is known as "cracked" gasoline. Nearly all gasoline sold for consumption is a combination with one or more of the three forms or else a blend with other products, particularly with naphtha.

Commercial manufacture of natural gas gasoline started in New York about 1910, and in 1911 the Bolivar Gasoline Company reported production of gasoline from gas of Allegany county wells. On account of limited supplies of natural gas, it is not expected that the industry will be greatly expanded. It would be practicable, however, to treat considerable additional supplies since the gas from which the gasoline is extracted is turned into the pipe lines for domestic consumption.

Production of natural gas gasoline in New York since 1919

YEAR	GALLONS	VALUE
1919.....	457 985	\$84 083
1920.....	411 078	75 576
1921.....	366 240	52 108
1922.....	506 200	61 415
1923.....	408 000	44 000
1924.....	476 753	49 639
Total.....	2 626 256	\$366 821

The accompanying table gives the output and value of the natural gas gasoline produced in New York since 1919. The quantities and values given represent the raw or unblended gasoline. In 1924 the amount of natural gas treated for gasoline amounted to 380,836,000 cubic feet. The raw or unblended gasoline obtained from the natural gas amounted to 476,753 gallons, which after blending produced 676,765 gallons of commercial gasoline. The companies reporting production of gasoline in New York during 1924 are as follows:

NAME	ADDRESS
Ebenezer Oil Company.....	Wellsville
Empire Gas & Fuel Co., Ltd.....	Wellsville
Nathan Nichols.....	Bradford, Pa.
F. J. Wilson.....	Bolivar
Power Gasoline Company.....	169 Davis street, Bradford, Pa.

PEAT

Deposits of peat occur in many sections of the State. The swamp lands have been estimated at about 5 per cent of the entire surface, or 1,600,000 acres. While most of the swamp areas contain peat, no detailed survey has been made of many of the peat deposits, nor has the thickness of the peat been determined except in some of the most important areas.

Although certain deposits of peat have been worked in a small way at various times and places for more than 100 years, the mining of peat has never become an important or a very successful industry. Peat as it comes from its natural bed is not a fuel. It often contains as much as 90 per cent of water. In addition to the expense of handling this dead weight of water, the difficulty experienced in removing the water from the peat has in most cases proved too costly for its successful production for fuel purposes. Artificial heat for drying the peat involves the expenditure of heat units almost equal to the value of the heat units of the recovered dried peat. By air drying, the moisture content may be reduced to about 25 to 30 per cent. This remaining moisture seems to be held in chemical combination and can be removed only at a high temperature with artificial heat but with a resulting loss of combustible matter in the peat. Air-dried peat, containing 25 to 30 per cent of moisture, has about one-half the heating value of commercial coal.

The possibilities of peat as a fuel together with the recovery of ammonia gas has been stated by B. F. Haanel as follows:

Unless the manufacture of peat fuel is conducted on a bog situated reasonably near a community which is able to take over the entire output produced, peat manufactured for domestic or fuel purposes alone would not prove a profitable venture. This is due to the comparatively low heating value of peat, to its moisture content and to the large volumes it occupies per heat unit, as compared with coal; and when to these disadvantages is added that of high freight rates per ton, the reason of the foregoing statement will be obvious. But while peat may serve as a domestic fuel in only certain cases, it may be well adapted for the production of power, or as fuel gas. This is especially so in the case of peat which has a high nitrogen content, since this element can be profitably recovered in the ammonia gas formed in the by-product recovery producer. According to the process employed in by-product recovery work, the ammonia gas is fixed with sulphuric acid, and the resulting product "ammonium sulphate" is then sold for agricultural purposes. The demand for this product is, today, greater than the supply, consequently its price per unit is somewhat high. Whenever, therefore, the nitrogen content of the peat is sufficiently high, the production of a fuel, or power gas, accompanied by by-product recovery, would prove profitable. But in

the case of the production of power, the same economics must be introduced into the manufacture of power that apply to a domestic fuel, and even though the content of nitrogen is well above the average, any increase in the cost of fuel rapidly decreases the expected profits. Peat is a low grade fuel which must be manufactured and sold at a comparatively low cost, if it is desired that it should serve as a substitute for coal. It is evident, therefore, for the foregoing reasons, that the manufacture of peat fuel does not hold forth any glowing prospects for getting rich quickly, although reasonable and very good profits should in almost every case be realized when the industry is run on a business-like basis. But the element of speculation, and some of the commonly practised methods of promotion must be eradicated if the peat industry is ever to become an accomplished fact.

Occurrences

Formerly extensive areas of peat lands were found in New York, Westchester and Putnam counties. Although some deposits are still to be found in Putnam county, the two former counties have been so built up that but little swamp land is left. Orange county is said to have had originally 40,000 acres of peat swamp. In that county the area west of Warwick, known as the Drowned lands, once contained 17,000 acres, but at present a considerable part has been drained for agricultural use. Some of the localities in Orange county together with the thickness of the peat are as follows: Pine island, 18 feet, bottom not reached; Black Walnut island, 18 feet, bottom not reached; one-half mile west of Durandville, 16 feet; another locality $1\frac{1}{2}$ miles west of Durandville, 17 feet; two localities near Big island, $12\frac{1}{2}$ feet, bottom not reached; Florida, 18 feet, bottom not reached. In Dutchess county, peat deposits are found near Pine Plains on the margin of Stissing pond and south along the valley.

In northern New York, peat beds are found in Washington county on the line of the Champlain canal in the town of Kingsbury. Other deposits in this region occur in the vicinity of Fort Edward and Glens Falls.

Large deposits of peat are found in northern New York on the northwestern side of the Adirondacks. Swamp lands are drained by the Black, Oswegatchie, Indian and Grass rivers. A number of years ago a dredge was built for recovering peat from Black lake, an expanded part of the Oswegatchie river. It is reported that the dredge was never placed in operation.

Large peat swamps occur in central and western New York. One of the important areas is just west of Rome, a portion of which was drained and put under cultivation at the time the Barge canal was

built. South of Oneida lake are the Cowaselon and Cicero swamps, which together have an east-west direction of more than 20 miles and a width of two miles. The eastern section of the Cowaselon swamp has been drained by the Douglas ditch and used for agricultural purposes. Montezuma marshes below the outlet of Cayuga lake are some eight miles long and two or three miles wide. Considerable peat areas occur here but the marshes are periodically flooded as they are intersected by the Seneca and Clyde rivers. In Genesee and Orleans counties is the great Oak Orchard swamp. Some parts of this have been drained for agricultural purposes although large deposits of peat still remain.

The production of peat at the present time amounts to but a few hundred tons annually, the larger part of the output being for agricultural purposes. The following producers have reported production in recent years: J. H. Blaine, Hopewell Junction; Green Vley Humus Co., Fishkill; William N. Craig, Fishkill; Alfred F. Sims, Sag Harbor.

References

- Beck, Lewis C.**
1842 Mineralogy of New York, p. 95-96; 192-94
- Hall, James**
1843 Geology of New York. Rep't on the Fourth District, p. 1-675
(refer to index under muck and under peat)
- Haanel, B. F.**
1914 Peat, Lignite and Coal. Mines Branch Dep't of Mines, Ottawa
- Mather, W. W.**
1943 Geology of New York. Rep't on the First District, p. 1-653
- Newland, D. H.**
1921 Peat. The Mineral Resources of the State of New York. N. Y. State Mus. Bul. 223-24, p. 197-202
- Parsons, Arthur L.**
1904 Peat, Its Formation, Uses and Occurrence in New York. N. Y. State Geol. 23d Rep't, p. 15-88
- Ries, H.**
1903 Uses of Peat and Its Occurrence in New York. N. Y. State Geol. 21st Ann. Rep't, p. r53-r90

PETROLEUM

Petroleum first became known to white men in America in 1627 in the country of the Neutral Indians, which later became Seneca territory. Mention is made of it by a French missionary, Joseph de la Roche D'Allion, and the oil referred to came presumably from a spring near Cuba, Allegany county. The oil was highly prized by the Indians for medicinal purposes and for many years was known as "Seneca oil." A number of references to Seneca oil are found in the early documents of colonial times, and, as early as 1767, a bottle of oil was brought to Niagara Falls by an Indian named Ash-cushang. The oil was sent to Sir William Johnson who at that

time was ill and at Saratoga Springs. In a communication to Sir William Johnson written from Niagara Falls is this statement, "We call it here Ashcushang's oil, that being the name of the person who brought it to this place."

The first oil well drilled in New York State was in 1864 at Limestone, Cattaraugus county, and by 1878, 250 wells were producing. In the early '80's, oil was found in Allegany county, and for a number of years the annual production of the State was over five million barrels. In addition to the pools in Allegany and Cattaraugus counties, a few small pools are located near the western border of Steuben county and a few wells produce oil in Chautauqua county. The present producing fields in the State have an area of about 50,000 acres and altogether there are more than 14,000 producing wells. Within the past 25 years no new pools of importance have been discovered, and it is not likely that the present producing fields will ever be much extended. Considerable border drilling about the present producing areas has developed no important additional supplies and the lower and older formations in the territory to the north have been fairly well tested as a result of drilling numerous gas wells. In addition to the gas wells a number of salt shafts and wells at the north have penetrated well into the Salina formation. The best hope for additional supplies of petroleum seems to lie in the deeper formations of the present producing counties.

The 1924 production of petroleum in New York amounted to 1,440,000 barrels. This is the largest production in a period of 33 years. Following the flush production after the discovery of oil in Allegany county, the annual production decreased until 1912 when but 782,661 barrels of oil were produced. Since 1912 the annual increase has been almost constant bringing the 1924 production to nearly double that of the year 1912.

Production of petroleum in New York since 1919

YEAR	BARRELS	VALUE
1919.....	851 000	\$3 100 000
1920.....	906 000	5 433 000
1921.....	988 000	3 262 000
1922.....	1 000 000	3 144 000
1923.....	1 250 000	4 140 000
1924.....	1 440 000	5 245 000
Total.....	6 435 000	\$24 324 000

The increase in production during recent years is largely due to a method for increasing the recovery of oil which is being used on many of the New York leases. The method of increasing production from old or in some cases from new oil wells is known as "flooding." The method of "flooding" is briefly as follows: Water is introduced into an oil well. The pressure created by a column of water, say 1000 feet high, results in driving the oil away from the bottom of the well in advance of the flood of water. Surrounding this well filled with water, other wells are drilled, and into them the oil is forced from the rocks by the pressure of the column of water in the water well. The wells drilled into the flood of oil are pumped until the water reaches them. They are then made into water wells and an ever enlarging circular flood of oil is driven away from these water pressure wells. New wells are again drilled into the flood of oil 100 to 200 feet away from the new water wells and the process is then repeated. The method just described is known as the circular flood.

Within the past three years there has been developed what is known as the "line flood." This differs from the method described only in arrangement of wells and but little attention is paid to wells previously drilled in the district. Instead of using an old oil well for the first water well, an entirely new row of water wells is drilled. Water wells, sometimes as many as 25 in number, are drilled in a row 150 feet apart. These wells all extend to the oil sand but are not pumped. They are simply filled with water and left for a year or more. Then two wells are drilled for each water well at right angles from the point midway between the water wells and 150 feet distant from the water wells. As in circular floods, when the oil wells go to water they in turn are made water wells, and new rows of wells for oil are drilled. Gratifying results as an outcome of flooding have been reported from many leases. Additional recovery of oil amounts in many cases from 2000 to 5000 barrels an acre. The oil fields of the State have already produced about 70,000,000 barrels of oil, and it is estimated that an additional 90,000,000 barrels may be obtained as a result of application of flooding and other methods for oil recovery, such as air or gas which may be used in supplying pressure to producing wells.

References

Ashburner, C. A.

- 1888 Petroleum and Natural Gas in New York State. Amer. Inst. Min. Eng. Trans., v. 16, p. 906-59; Author's Edition, 1888, p. 1-54

Bishop, I. P.

- 1899 Petroleum and Natural Gas in Western New York. N. Y. State Mus. Ann. Rep't 51, v. 2, p. 9-63
 1901 Oil and Gas in Southwestern New York. N. Y. State Mus. Ann. Rep't 53, v. 1, p. 1105-1134

Hartnagel, C. A.

- 1922 National Petroleum News, Feb. 1, 1922, p. 53-54

Hartnagel, C. A. & Russell, W. L.

- 1925 The Oil Fields of New York State. Bul. Am. Ass'n Pet. Geol., v. 9, July, 1925, p. 798-802

Orton, Edward

- 1899 Petroleum and Natural Gas in New York. N. Y. State Mus. Bul. 30, p. 395-526

Van Ingen, D. A.

- 1895 Petroleum in New York State. N. Y. State Mus. Bul. 15, p. 558-60

PYRITE

Pyrite, the sulphide of iron, occurs chiefly in the Precambrian schists and gneisses of the Adirondacks and the Highlands of the Hudson. In the Adirondack region the main deposits are in St Lawrence and Jefferson counties. Here the pyrite is found in a series of belts or zones, the most important of which is 40 miles long and three to four miles wide. The ore as mined and before concentration contains up to 25 to 30 per cent of sulphur. Concentration raises the sulphur content from between 40 to 48 per cent.

The principal pyrite mines operated during recent years are those at Pyrites, the Stella mines near Hermon and the Cole mine near Gouverneur. At Edwards pyrite is also obtained as a by-product in the zinc mining operations.

In the Highlands there has been no active mining in many years. A deposit of pyrite and pyrrhotite at Anthony's Nose, a steep prominence on the Hudson above Peekskill, was once worked for a period of years, and the output used locally for the manufacture of sulphuric acid. The ore is said to have carried a sulphur content of 28 per cent. The mine was worked to a depth of from 300 to 400 feet. The vein had a thickness of from 20 to 30 feet and on the line of strike was worked for a width of 50 feet.

Production of pyrite in New York since 1904

YEAR	LONG TONS	VALUE
1904.....	5 275	\$20 820
1905.....	10 100	40 465
1906.....	11 798	35 550
1907.....	49 978	162 430
1908.....	23 775	104 798
1909.....	.....	a
1910.....	37 270	175 791
1911.....	53 453	251 466
1912.....	58 137	286 577
1913.....	54 903	242 065
1914.....	61 513	266 930
1915.....	57 241	265 362
1916.....	.....	a
1917.....	57 075	354 000
1918.....	63 982	422 958
1919.....	60 544	468 257
1920.....	30 753	261 575
1921.....	.....	a
1922.....	5 900	a
1923.....	11 000	a
1924.....	7 593	16 705

a Figures can not be disclosed.

The production and value of the pyrite mined in New York since 1904 is given in the accompanying table. The curtailment of production in the past few years is due to low prices for sulphur. Pyrite producers can not compete under present conditions with domestic sulphur produced in Louisiana and Texas or even with pyrite imported from Spain. At present the only pyrite produced in the State is by the New York Zinc Company at Edwards, the pyrite being a by-product of their zinc mines.

References

Brinsmade, Robert B.

- 1906 Pyrites Mining and Milling in St Lawrence County, New York. The Mineral Industry, v. 14, p. 525-27

Buddington, A. F.

- 1917 Report on the Pyrite and Pyrrhotite Veins in Jefferson and St Lawrence Counties, New York. N. Y. State Defense Council Bul. 1, p. 1-40

Newland, D. H.

- 1917 Pyrite in Northern New York. Eng. & Min. Jour., Dec. 1, 1917, p. 947-48
 1917a The Zinc-Pyrite Deposits of the Edwards District, New York. N. Y. State Defense Council Bul. 2, p. 1-72
 1921 Pyrite. The Mineral Resources of the State of New York. N. Y. State Mus. Bul. 223-24, p. 209-18

Smyth, C. H. jr

- 1912 On the Genesis of the Pyrite Deposits of St Lawrence County, N. Y. N. Y. State Mus. Bul. 158, p. 143-82

Vogel, Felix A.

- 1908 Pyrites Mining and Milling in St Lawrence County, New York. The Mineral Industry, v. 16, p. 845-51

QUARTZ

Quartz or silica is a very abundant mineral in nature. It constitutes the main mass of sandstones, quartzites and river, beach and glacial sands. It is also a common component of many other kinds of rocks, such as granites, gneisses and schists. Some reference to the uses of the purer unconsolidated or loose sands is given under the chapter heading, "Sand and Gravel."

In spite of its great abundance in nature, supplies of high-grade silica are not common. The best quartz material in the State is found either as vein quartz or in pegmatite dikes where it is associated with feldspar, as has been described in the feldspar chapter. In certain localities sandstones, such as the Potsdam of northern New York and the Oriskany of central New York, have a high silica content. The Shawangunk grit, outcropping in Ulster, Orange and Sullivan counties, is worked for millstones and also contains high-grade silica material which was once used for glass-making at Ellenville. The Poughquag quartzite of the Highland region contains a number of beds of nearly pure quartz. No large masses of vein quartz are known. Vein quartz from the vicinity of Fort Ann and Port Henry were once worked for the purpose of making wood filler.

At present but two firms in the State are producing quartz. These are the Bedford Mining Company of Bedford, Westchester county, where the quartz is mined in connection with the feldspar operations, and the New York Pyrites Company, Inc., which has recently opened up a quartz quarry near Gouverneur, St Lawrence county.

As there are only two producers, statistics of production and value of quartz can not be published separately, but since some of the output is mined and sold along with feldspar, its total tonnage and value has been included in the table, "Feldspar and Quartz," given in the chapter on feldspar.

References

Colony, R. J.

1919 High-Grade Silica Materials for Glass, Refractories and Abrasives. N. Y. State Mus. Bul. 203-4, p. 1-31

Newland, D. H.

1921 Quartz. The Mineral Resources of the State of New York. N. Y. State Mus. Bul. 223-24, p. 218-21

SALT

The salt industry of New York State has long been of great importance. In the pioneer days the industry was centered about Syracuse, and for almost 100 years this region contributed nearly all the brine for the salt manufactured in the State. With the develop-

ment of rock salt beds, reached by deep wells and shafts, however, in the region south of the Salina formation, the importance of the Syracuse salt district has gradually declined. The decline is due in part to the weakening of the Syracuse brines as a result of long-continued pumping.

Since the beginning in a practical way of the salt industry in 1797, complete records of the annual salt production in the State are available. In 1797 the production amounted to 5095 barrels, and in 1924 to 14,091,486 barrels. The total production of the State from 1797 to 1924 inclusive is more than 400,000,000 barrels.

The beds of rock salt all belong to the Salina formation, which is of Silurian age. Along the outcropping area of the Salina beds, salt brines have been found at a few places, the most noteworthy of which is the Syracuse region, but along the outcrop no valuable beds of rock salt are found. Nor has there been any development of rock salt beds near the northern edge of the salt belt where surface waters have limited mining operations, but to the south under the cover of the higher Devonian rocks, beds of rock salt occur which have an area of several thousand square miles. Beds of rock salt are known from Madison county on the east to Erie county on the west—a distance of about 140 miles. The width, or north and south extension, of the salt beds has not been established, but the north-south distance between some of the present workings is more than 30 miles. As the salt beds dip farther to the south, the greater thickness of overlying rocks in that direction limits practical development under present conditions. That the salt beds do extend much farther to the south than any of the present salt operations has been demonstrated by deep wells drilled for gas or oil.

In thickness the beds of rock salt vary considerably, and often several beds of salt separated by rock are found in the same well or salt shaft. Beds of salt up to 75 or more feet have been found in wells and shafts, while the aggregate thickness of all the salt beds in a single well has been reported as exceeding 200 feet. The distance from the surface to the beds of rock salt at places where operations have been conducted varies from about 1200 to 2400 feet.

Location of Salt Wells and Mines

In addition to the brines obtained near Syracuse, the deep salt wells at Tully, Onondaga county, 17 miles south of Syracuse, supply brines which are conducted through a pipe line to the Solvay Process Company at Solvay for the manufacture of soda products.

Near the head of Cayuga lake in Tompkins county, salt wells and shafts are located on the east side of the lake, and in Schuyler county adjoining at the west, a group of wells are located near the head of Seneca lake in the vicinity of Watkins. In western New York the salt industry is confined to the three adjoining counties of Genesee, Wyoming and Livingston, with the wells and shafts located mainly in the Genesee and Oatka valleys. In addition to the above localities recent tests at Himrod, Yates county, have definitely proved the presence of good grades of rock salt suitable for mining. Similar tests recently made four miles south of Avon, Livingston county, and about midway between the Retsof and Livonia salt shafts, have demonstrated the presence of additional supplies of workable rock salt beds in the Genesee valley district.

Production of salt in New York since 1919

YEAR	BARRELS	VALUE
1919.....	13 913 064	\$7 159 547
1920.....	13 593 578	7 584 921
1921.....	10 392 957	6 505 041
1922.....	14 006 193	7 066 409
1923.....	14 756 014	7 431 155
1924.....	14 091 486	6 739 597
Total.....	80 753 292	\$42 486 670

Production of salt by grades in 1920

GRADE	BARRELS	VALUE	VALUE A BARREL
Common fine.....	1 329 435	\$1 407 951	\$1 06
Common coarse.....	448 685	498 497	1 11
Table and dairy.....	1 424 014	1 915 909	1 35
Solar.....	132 007	147 843	1 12
Other grades <i>a</i>	10 259 437	3 614 721	35
Total.....	13 593 578	\$7 584 921	\$ 56

a Includes rock, pressed blocks, other grades, brine and fractional parts of barrels of each kind mentioned in this table.

Production of salt by grades in 1921

GRADE	BARRELS	VALUE	VALUE A BARREL
Common fine.....	I 517 093	\$I 829 452	\$I 2I
Table and dairy.....	I 029 507	I 104 372	I 07
Solar.....	73 757	82 224	I II
Other grades <i>a</i>	7 772 600	3 488 993	45
Total.....	10 392 957	\$6 505 041	\$ 63

a Includes rock salt, pressed blocks from rock salt, refuse salt and brine salt.

Production of salt by grades in 1922

GRADE	BARRELS	VALUE	VALUE A BARREL
Common fine.....	I 778 678	\$I 944 390	\$I 09
Table and dairy.....	I 136 821	I 123 271	99
Solar.....	73 771	61 257	83
Other grades <i>a</i>	II 016 923	3 937 491	36
Total.....	14 006 193	\$7 066 409	\$ 50

a Includes rock, pressed blocks from rock salt and brine.

Production of salt by grades in 1923

GRADE	BARRELS	VALUE	VALUE A BARREL
Common fine.....	I 709 971	\$2 190 925	\$I 28
Table and dairy.....	I 081 364	I 101 578	I 02
Other grades <i>a</i>	II 964 679	4 138 652	35
Total.....	14 756 014	\$7 431 155	\$ 50

a Includes solar, pressed blocks from rock salt, brine and rock.

Production of salt by grades in 1924

GRADE	BARRELS	VALUE	VALUE A BARREL
Common fine.....	I 764 264	\$2 006 785	\$I 14
Table and dairy.....	I 044 850	923 099	88
Other grades <i>a</i>	II 282 372	3 809 713	33
Total.....	14 091 486	\$6 739 597	\$ 48

a Includes pressed blocks from rock salt, brine and rock.

Producers of salt in New York

OPERATOR	ADDRESS	LOCATION OF MINE
<i>Genesee county</i>		
LeRoy Salt Co.....	LeRoy.....	LeRoy
<i>Livingston county</i>		
Sterling Salt Co.....	29 Broadway, New York.	Cuylerville
Alex. Kerr Bro. & Co.....	516 N. Delaware avenue, Philadelphia, Pa.....	Piffard
Retsof Mining Co.....	Scranton Life Building, Scranton, Pa.....	Retsof
<i>Onondaga county</i>		
Thomas Gale.....	Box 433, Syracuse.....	Syracuse
Thomas P. Murray.....	Liverpool.....	Liverpool
The Solvay Process Co.....	Syracuse, N. Y.....	{ Works at Solvay Wells at Tully
<i>Schuyler county</i>		
International Salt Co., Inc.....	Scranton, Pa.....	Watkins
Watkins Salt Co.....	Watkins.....	Watkins
<i>Tompkins county</i>		
Cayuga Rock Salt Co., Inc.....	Myers.....	Myers
Remington Salt Co.....	Ithaca.....	Ithaca
International Salt Co., Inc.....	Scranton, Pa.....	Myers
<i>Wyoming county</i>		
Rock Glen Salt Co.....	Rock Glen.....	Rock Glen
Worcester Salt Co.....	71 Murray street, New York.....	Silver Springs

References

- Beck, Lewis C.**
1842 Mineral Springs. Mineralogy of New York, p. 99-127
- Bishop, I. P.**
1886 Salt Wells of Western New York. N. Y. State Geol. 5th Ann. Rep't, p. 12-47
1892 Report on the Development of the Salt Industry of Central New York for the Year 1891. N. Y. State Mus. 45th Ann. Rep't, p. 53-61
- Hall, James**
1843 Geology of New York. Report on Fourth District, p. 1-675
- Luther, D. D.**
1894 Report on the Geology of the Livonia Salt Shaft. N. Y. State Geol. 13th Ann. Rep't, p. 21-130
1899 The Brine Springs and Salt Wells of the State of New York, and the Geology of the Salt District. N. Y. State Geol. 16th Ann. Rep't, p. 171-226
- Merrill, F. J. H.**
1893 Salt and Gypsum Industries of New York. N. Y. State Mus. Bul. 11, p. 1-89
- Newland, D. H.**
1921 Salt. The Mineral Resources of the State of New York. N. Y. State Mus. Bul. 223-24, p. 221-35
- Vanuxem, L.**
1842 Geology of New York. Report on Third District, p. 1-306
- Werner, Charles J.**
1917 History of the Manufacture and Mining of Salt in New York State, p. 1-144

SAND AND GRAVEL

The reported production of sand and gravel in 1924 amounted to 13,397,540 tons valued at \$8,583,193. As shown by the accompanying tables the output in both tonnage and value has greatly increased since 1919. The statistics are based on reports of more than 200 producers operating in 41 counties of the State. The tables showing production do not represent the entire output and are probably understated by about 15 per cent. The sand and gravel operations are so widespread and many of them of such a temporary nature that it is difficult to obtain complete information relating to all operations. The data presented, however, cover most of the large and more or less staple activities of the industry. Those for molding sand are believed to be fairly complete. This is made possible by the fewer number of operators and more restricted areas from which molding sand is obtained. In addition to the sand and gravel used mostly for construction work, certain grades of sand serving special uses are obtained in some sections of the State. These grades include fire or furnace sand, glass sand, engine sand, filter sand and sand for grinding and polishing, and molding sand. In the tables, with the exception of molding sand and fire or furnace sand, the special grades are included with "other" sand.

The 1924 production of molding sand amounted to 607,089 tons valued at \$1,040,735. By far the greater part of the production came from what is known as the Albany molding sand district. This district includes an area extending from southern Warren county on the north, to near the southern limit of Dutchess and Ulster counties on the south. In this distance of more than 100 miles molding sand is found on both sides of the Hudson river. In the adjoining counties of Albany and Saratoga there is a westerly extension of the district, on both sides of the Mohawk river, thus extending the molding sand district into Schenectady county. Outside of the Albany molding sand district, the following counties reported production: Cattaraugus, Cayuga, Chautauqua, Kings, Livingston, Monroe, Nassau, Oneida, Queens, Tioga and Wayne. The annual production of molding sand since 1904 is given in the accompanying table.

References

Nevin, Charles M.

1925. Albany Molding Sands of the Hudson Valley. N. Y. State Mus. Bul. 263, p. 1-81

Newland, D. H.

- 1916 Albany Molding Sand. N. Y. State Mus. Bul. 187, p. 107-15
1921 Sand and Gravel. The Mineral Resources of the State of New York. N. Y. State Mus. Bul. 223-24, p. 235-42

Sarle, Clifton J.

- 1904 Economic Geology of Monroe County and Contiguous Territory. N. Y. State Geol. 22d Ann. Rep't, p. 192-1100

Production of sand and gravel

MATERIAL	1919		1920	
	Short tons	Value	Short tons	Value
Building sand.....	1 974 827	\$705 603	3 192 796	\$1 489 248
Molding sand.....	418 319	609 730	590 577	1 232 721
Fire or furnace sand.....	a	a	39 772	56 574
Other sand.....	110 059	71 738	277 251	178 141
Gravel.....	1 484 782	859 809	2 026 622	1 381 773
Total.....	3 987 987	\$2 246 880	6 127 018	\$4 338 457

a Included under other sand.

Production of sand and gravel

MATERIAL	1921		1922	
	Short tons	Value	Short tons	Value
Building sand.....	3 818 671	\$1 815 086	4 588 446	\$2 171 806
Molding sand.....	288 354	447 481	579 999	855 682
Fire or furnace sand.....	21 240	34 660	17 479	14 193
Other sand.....	393 354	351 893	776 697	512 235
Gravel.....	1 499 610	1 024 007	2 340 771	1 531 396
Total.....	6 021 229	\$3 673 127	8 303 392	\$5 085 312

Production of sand and gravel

MATERIAL	1923		1924	
	Short tons	Value	Short tons	Value
Building sand.....	5 491 031	\$2 661 227	8 542 247	\$4 330 551
Molding sand.....	731 896	1 212 798	607 089	1 040 735
Fire or furnace sand.....	15 005	10 817	5 743	4 481
Other sand.....	1 053 662	762 139	144 907	95 833
Gravel.....	3 438 631	2 644 095	4 097 554	3 111 593
Total.....	10 730 225	\$7 291 076	13 397 540	\$8 583 193

Production of molding sand in New York since 1904

YEAR	SHORT TONS	VALUE
1904.....	320 825	\$262 997
1905.....	503 307	457 375
1906.....	215 368	151 268
1907.....	693 293	539 674
1908.....	312 819	277 290
1909.....	468 609	437 402
1910.....	471 351	424 015
1911.....	476 014	420 780
1912.....	469 138	422 148
1913.....	504 348	449 224
1914.....	310 727	310 727
1915.....	454 511	415 073
1916.....	661 673	570 898
1917.....	650 427	808 550
1918.....	519 681	770 512
1919.....	418 319	609 730
1920.....	590 577	I 232 721
1921.....	288 354	447 481
1922.....	579 999	855 682
1923.....	731 896	I 212 798
1924.....	607 089	I 040 735
Total.....	10 248 325	\$12 117 080

SAND-LIME BRICK

Sand-lime brick are made from a combination of sand and hydrated lime. The brick are molded under heavy pressure and then subjected to steam pressure in a hardening chamber. This process forms a hard, hydrous silicate of lime that binds the sand together. Five to 20 per cent of lime is used.

The first plants for the manufacture of sand-lime brick were erected about 1903. In 1906 seven of the plants reporting showed a production of 17,080,000 brick having a value \$122,340. At the close of 1906 nine plants were in operation and one under course of construction. In 1908 the industry received a decided setback and several of the plants went out of business. The industry as a whole has made no great progress and present production is limited to three companies as follows: Buffalo Sandstone Brick Company, 189 Fillmore avenue, Buffalo; Paragon Plaster Company, Syracuse; Rochester Composite Brick Company, Rochester.

The annual production and value since 1906 are presented herewith.

Production of sand-lime brick since 1906

YEAR	PRODUCTION	VALUE
1906.....	17 080 000	\$122 340
1907.....	16 610 000	109 677
1908.....	8 239 000	55 688
1909.....	12 683 000	81 693
1910.....	14 053 000	82 619
1911.....	15 178 000	92 064
1912.....	21 231 000	133 736
1913.....	22 225 000	143 345
1914.....	17 696 000	111 326
1915.....	18 226 000	115 912
1916.....	15 851 000	109 337
1917.....	15 535 000	130 626
1918.....	6 776 000	79 515
1919.....	10 958 000	159 399
1920.....	11 294 000	176 114
1921.....	a	a
1922.....	a	a
1923.....	15 646 000	204 433
1924.....	16 529 000	220 851

a Less than three producers; figures can not be published.

SLATE

The active slate quarries of the State are confined to Washington county. The district extends to the Vermont state line, where it continues as the well-known Vermont slate district.

The slate belt of Cambrian and Ordovician ages is highly folded and the quarry faces usually show a steep dip. In color the quarried slate includes red, purple and unfading green as contrasted with sea-green, which in course of time changes to brownish. Black and variegated varieties are also produced.

Production

The value of the slate of all kinds produced in Washington county in 1924 amounted to \$962,276. The large increase in the total value of slate during recent years is due to the output of slate granules. Granules are crushed or ground slate. The prevailing sizes are 10 to 25 mesh, but some run as low as eight and others as high as 30 mesh. They serve as a good roofing material and are held together by asphalt binders. The production of granules was first reported in 1917, when 4858 tons of granules valued at \$27,696 were reported. The 1924 production amounted to 119,210 tons and was valued at \$770,959.

Roofing slate produced in 1924 amounted to 10,974 squares valued at \$170,749. This was more than double the production in 1923 and the largest output since 1911.

Production of slate in New York since 1919

YEAR	ROOFING SLATE		OTHER KINDS	TOTAL VALUE
	Squares	Value	Value	
1919.....	3 386	\$35 138	\$415 241	\$450 379
1920.....	6 607	97 244	814 049	911 293
1921.....	4 100	59 106	457 850	516 956
1922.....	1 215	22 537	620 435	642 972
1923.....	4 475	67 741	859 657	927 398
1924.....	10 974	170 749	791 527	962 276
Total.....	30 757	\$452 515	\$3 958 759	\$4 411 274

In addition to the values credited to roofing slate and granules, other slate was produced to the amount of \$20,568. Items constituting this value include flagging, structural and sanitary slate.

Slate producers reporting production in 1924 follow:

NAME	ADDRESS
Old English Slate Quarries.....	Glens Falls
J. B. Preston Co.....	25 Broad street, New York
Jno. J. McDonough.....	West Pawlet, Vt.
Amalgamated Slate Quarries Company	Easton, Pa.
The Dorrco Slate Co.....	101 Park avenue, New York City
Ellis Bros. & Diplock.....	Middle Granville
G. H. Hopkins	Whitehall
H. C. McDonough	Middle Granville
Kelly & Owens	Middle Granville
Edwards & Thomas.....	Middle Granville
Darius & Jones.....	Middle Granville
Sheldon Slate Products Co.....	Middle Granville
Staso Milling Co.....	332 S. Michigan street, Chicago, Ill.
Advance Industrial Supply Co.....	111 W. Washington boulevard, Chicago, Ill.

References

- Dale, T. Nelson**
1899 The Slate Belt of Eastern New York and Western Vermont. U. S. Geol. Surv. 19th Ann. Rep't, Part 3, p. 153-307
- Dale, T. Nelson & others**
1914 Slate in the United States. U. S. Geol. Surv. Bul. 586, p. 1-222
- Leighton, Henry**
1910 Slate. N. Y. State Mus. Bul. 142, p. 70-74
- Mather, W. W.**
1843 Geology of New York. Report on First District, p. 419-21
- Nevius, J. N.**
1901 Roofing Slate Quarries of Washington County. N. Y. State Geol. 19th Ann. Rep't, p. 1135-1150

Newland, D. H.

1921 Slate. The Mineral Resources of the State of New York. N. Y. State Mus. Bul. 223-24, p. 242-47

Smock, John C.

1890 Building Stones in New York. N. Y. State Mus. Bul. 10, p. 279-81

STONE

Under the term "stone" are included the quarry products of granite, limestone, marble, sandstone and trap, or basalt. These quarry materials are variously distributed in different sections of the State. In northern New York the deposits of granite are limited to the Adirondack and the Thousand Islands regions. In southern New York granites are found in the Highlands of the Hudson, with a few outlying areas adjacent to these mountains.

The limestones may be regarded as of two distinct types in so far as their geologic ages are concerned. The Precambrian limestones including marbles are involved with the Adirondacks and the Highlands. The sedimentary limestones of Cambrian and later ages are usually distributed in belts, some of which extend nearly across the entire State. The Cambrian and Ordovician limestones form more or less a belt encircling the Adirondacks with extensive areas projecting into the upper Hudson, Mohawk and Black river valleys. Several belts of limestones of these ages are found crossing the Hudson river valley north of the Highlands. None of the formations previously mentioned is found outcropping in western New York, but nearly all of them have been penetrated by wells drilled for natural gas and are found to lie 2000 or more feet below the surface.

The Silurian limestones are found in several belts more or less parallel to one another. The lowest are the Clinton limestones extending from northern Wayne county to the Niagara river. The Niagara or Lockport limestone is first found in southern Herkimer county and with increasing thickness extends almost directly west to the Niagara river. Of the Silurian limestones only the Manlius is present in eastern New York. It is always found directly below the Coeymans, the lowest member of the Helderberg limestones. Of the Devonian formations the Helderberg limestones include the Coeymans and Becraft with others of lesser economic value. In some quarry operations the Manlius, Coeymans and Becraft limestones are near enough so that they can readily be operated almost as a single quarry.

The Onondaga limestone of Devonian age is the most persistent and widespread limestone formation in the State. It is also the most easily traced along the line of outcrop and nearly everywhere forms

an escarpment. Starting at Buffalo, the Onondaga extends eastward to the vicinity of LeRoy, Phelps, Geneva, just south of Syracuse, then to Richfield Springs, Cherry Valley and Cobleskill. From there it passes into the Helderbergs of Albany county, where the formation turns south and is found outcropping a few miles west of the Hudson river until Kingston is reached. There the formation again changes its direction to the southwestward and passes out of the State near Port Jervis.

The highest Devonian limestone in the State is the Tully. Its best exposures are seen in the vicinity of Cayuga lake. From this point it thins rapidly along line of outcrop and is of no economic importance in Ontario county to the west, or in Chenango county to the east. Practically all of the southern sections of the State, from the Catskills west, including the southern tier of counties bordering on Pennsylvania, are without limestone formations.

The oldest sandstone formation in the State is known as the Potsdam. This formation is usually found along the borders of the Adirondacks. The principal exposures are on the northern and northwestern sides of the Adirondacks. Smaller areas occur on the east side of the Adirondacks, principally in the counties of Essex, Washington, Warren and Saratoga, with a few exposures on the south side of the Adirondacks, north of the Mohawk valley. At the present time quarrying of Potsdam sandstone is very much restricted, and outside of local uses only now and then is the Potsdam quarried on a commercial scale. In certain areas the Potsdam sandstone has a high silica content and might well serve in the manufacturing of ferroalloys.

The Hudson River formation has a wide distribution in the Hudson and Mohawk valleys. The formation includes numerous beds of sandstone and formerly quarries were operated in the vicinity of Rhinebeck, New Baltimore, Troy, Albany and Schenectady. The quarries at Schenectady have produced excellent building stone.

The Medina sandstone formation extends from central New York west to the Niagara river. At present the only important quarry operations are carried on in Orleans county. Formerly quarries were operated in all the counties between Monroe and Niagara. In central New York certain beds of the Clinton formation are of sandstone and have produced considerable material at Clinton. Clinton sandstone has also been quarried in Oneida and Herkimer counties. The Devonian sandstones, quarried mostly as bluestone, are widespread and include most of the Catskills and the region to the west as far as Lake Erie and south to the Pennsylvania state line.

Trap is represented mainly by the Palisades of the Hudson. Quarrying of trap in recent years has been much restricted, largely due to the taking over of the most valuable sites, facing the Hudson river, for the Palisades Interstate Park.

Production

The total value of stone produced in 1924 amounted to \$11,973,613. Of the various kinds of stone produced granite was valued at \$211,766 and limestone at \$9,461,774. The value of the limestone as given includes the value of lime but does not include the value of limestone which is used in cement manufacture. The marble produced amounted to \$532,358. Sandstone including bluestone was valued at \$1,529,590. Of this value the sandstone is credited with \$798,807 and bluestone \$730,783. The value of trap with which is included the value of miscellaneous stone is \$238,125. The only large increase in production over a series of years is that of limestone. Since 1904 the annual value of limestone produced has increased more than \$7,000,000. The other kinds of stone reported have either shown but slight increases or in some cases an actual loss in value of production. The value of the various kinds of stone produced since 1904 exceeds \$150,000,000.

Production of stone in New York since 1919

YEAR	GRANITE	LIMESTONE	MARBLE	SANDSTONE	TRAP	TOTAL
1919.....	\$94 820	\$5 538 581	\$250 244	\$384 516	\$619 799	\$6 988 735 ^a
1920.....	204 491	7 151 151	220 773	547 424	794 653	9 061 707 ^a
1921.....	232 190	7 748 530	255 530	901 915	201 677	9 464 630 ^a
1922.....	370 471	7 469 370	336 956	1 372 429	151 977	9 756 674 ^a
1923.....	204 578	8 501 621	412 875	1 259 257	269 730 ^b	10 648 061
1924.....	211 766	9 461 774	532 358	1 529 590	238 125 ^b	11 973 613
Total..	\$1 318 316	\$45 871 027	\$2 008 736	\$5 995 131	\$2 275 961	\$57 893 420

^a Includes value of miscellaneous stone for which no separated column is given.

^b Includes value of miscellaneous stone.

Production of stone according to use in year 1919

KIND	BUILDING STONE	MONU- MENTAL	CURBING AND FLAGGING	CRUSHED STONE	ALL OTHER STONE	TOTAL VALUE
Granite.....	\$8 673	\$6 703	.....	\$39 797	\$39 647	\$94 820
Limestone.....	9 490	.....	.....	3 062 580	2 466 511	5 538 581
Marble.....	118 635	88 394	.....	37 258	5 957	250 244
Sandstone.....	137 836	.....	\$154 775	51 859	40 046	384 516
Trap.....	.....	.....	.....	619 799	.....	619 799
Miscellaneous stone.....	.....	.....	.....	30 848	69 927	100 775
Total.....	\$274 634	\$95 097	\$154 775	\$3 842 141	\$2 622 038	\$6 988 735

Production of stone according to use in 1920

KIND	BUILDING STONE	MONU- MENTAL	CURBING AND FLAGGING	CRUSHED STONE	ALL OTHER STONE	TOTAL VALUE
Granite.....	\$23 680	\$33 042	.....	\$44 101	\$103 659	\$204 491
Limestone.....	16 500	.....	.....	4 518 038	2 616 613	7 151 151
Marble.....	49 074	83 461	.....	.....	88 238	220 773
Sandstone.....	175 476	.....	\$255 959	.....	115 989	547 424
Trap.....	.....	.....	.....	794 653	.....	794 053
Miscellaneous stone.....	.....	.....	.....	43 215	100 000	143 215
Total.....	\$264 739	\$116 503	\$255 959	\$5 400 007	\$3 024 499	\$9 061 707

Production of stone according to use in 1921

KIND	BUILDING STONE	MONU- MENTAL	CURBING AND FLAGGING	CRUSHED STONE	ALL OTHER STONE	TOTAL VALUE
Granite.....	\$114 165	\$20 233	\$45 620	\$52 172	.....	\$232 190
Limestone.....	85 981	.....	.....	5 665 086	\$1 997 463	7 748 530
Marble.....	61 169	111 718	.....	.....	82 643	255 530
Sandstone.....	220 981	11 585	559 382	108 538	1 429	901 915
Trap.....	.....	.....	.....	201 677	.....	201 677
Miscellaneous stone.....	.....	.....	.....	102 045	22 743	124 788
Total.....	\$482 296	\$143 536	\$605 002	\$6 129 518	\$2 104 278	\$9 464 630

Production of stone according to use in 1922

KIND	BUILDING STONE	MONU- MENTAL	CURBING AND FLAGGING	CRUSHED STONE	ALL OTHER STONE	TOTAL VALUE
Granite.....	\$71 426	\$44 968	\$67 178	\$50 728	\$136 171	\$370 471
Limestone.....	114 771	.....	.....	5 277 871	2 076 728	7 469 370
Marble.....	151 480	77 963	.....	107 513	.....	336 956
Sandstone.....	295 013	.....	750 056	327 360	.....	1 372 429
Trap.....	.....	.....	.....	151 977	.....	151 977
Miscellaneous stone.....	.....	.....	.....	55 471	.....	55 471
Total.....	\$632 690	\$122 931	\$817 234	\$5 970 920	\$2 212 899	\$9 756 674

Production of stone according to use in 1923

KIND	BUILDING STONE	MONU- MENTAL	CURBING, FLAGGING AND PAVING	CRUSHED STONE	ALL OTHER STONE	TOTAL VALUE
Granite.....	\$34 965	\$36 344	\$47 450	\$38 645	\$47 174	\$204 578
Limestone.....	95 930	.....	.....	5 897 017	2 508 674	8 501 621
Marble.....	67 804	86 691	.....	258 380	.....	412 875
Sandstone.....	298 226	.....	721 689	227 853	11 489	1 259 257
Trap.....	.....	.....	.....	267 300a	2 430	269 730
Total.....	\$496 925	\$123 035	\$769 139	\$6 689 195	\$2 569 767	\$10 648 061

Production of stone according to use in 1924

KIND	BUILDING STONE	CURBING, FLAGGING AND PAVING	CRUSHED STONE	ALL OTHER STONE	TOTAL VALUE
Granite.....	\$81 731 ^a	<i>b</i>	<i>b</i>	\$130 035	\$211 766
Limestone.....	83 469	.....	\$7 062 880	2 315 425	9 461 774
Marble.....	176 019 ^a	.....	\$1 356 339	.....	532 358
Sandstone.....	401 371	\$875 294	250 372	2 553	1 529 590
Trap.....	.....	.....	238 125 ^c	.....	238 125
Total.....	\$742 590	\$875 294	\$7 907 716	\$2 448 013	\$11 973 613

a Includes monumental stone.

b Included in all other.

c Includes miscellaneous stone.

LIME

Production. The 1924 production of lime amounted to 98,592 short tons valued at \$991,799. The output was reported by twelve companies. Plants for lime burning are located in the following counties: Clinton, Dutchess, Erie, Fulton, Jefferson, Seneca, Ulster, Warren and Washington.

Tables showing the annual production of lime for the years 1919 to 1924 are here included with tonnages and values of tonnages by industries. It is apparent from each of the tables that less than 5 per cent of the lime manufactured in any one year is used for agricultural purposes. A larger and fairly constant percentage (17 to 26 per cent for each year) is used for building purposes. The great bulk of the lime manufactured, however, goes into the chemical industries. Certain of these industries use lime in such substantial quantities that they have been listed by themselves. Thus the lime sold for use in paper mills rivals in quantity and value that used in the entire building industry, and is listed by itself. Rather substantial tonnages are also used in metallurgy, in tanneries and in the sugar industry. Lime is used in small quantities in more than 100 additional chemical or other industries, and products sold for such purposes have been grouped under the headings "chemical works" and "other uses."

A table is also given showing production and values of lime since 1904.

Production of lime in New York in 1919

KINDS	SHORT TONS	VALUE
Building.....	21 881	\$185 318
Chemical works.....	42 905	392 225
Paper mills.....	29 590	253 187
Sugar factories.....	a	a
Tanneries.....	4 384	63 765
Fertilizers.....	6 206	34 574
Metallurgy.....	10 880	118 410
Other uses.....	10 558	84 381
Total.....	126 404	\$1 131 860

a Included under other uses.

Production of lime in New York in 1920

KINDS	SHORT TONS	VALUE
Building.....	22 082	\$266 639
Chemical works.....	9 503	115 123
Paper mills.....	25 796	280 110
Sugar factories.....	a	a
Tanneries.....	4 235	65 345
Fertilizers.....	3 323	23 912
Metallurgy.....	13 151	151 509
Other uses.....	14 267	144 623
Total.....	92 357	\$1 047 261

a Included under other uses.

Production of lime in New York in 1921

KINDS	SHORT TONS	VALUE
Building.....	17 603	\$207 829
Chemical works.....	5 866	63 704
Paper mills.....	18 200	202 838
Sugar factories.....	a	a
Tanneries.....	4 336	62 196
Fertilizers.....	3 917	30 334
Metallurgy.....	5 808	67 347
Other uses.....	11 955	125 051
Total.....	67 685	\$759 299

a Included under other uses.

Production of lime in New York in 1922

KINDS	SHORT TONS	VALUE
Building.....	25 174	\$250 502
Chemical works.....	5 161	54 083
Paper mills.....	19 514	193 354
Sugar factories.....	<i>a</i>	<i>a</i>
Tanneries.....	3 637	41 845
Fertilizers.....	2 751	22 613
Metallurgy.....	11 898	117 426
Other uses.....	28 185	277 256
Total.....	96 320	\$957 079

a Included in other uses.

Production of lime in New York in 1923

KINDS	SHORT TONS	VALUE
Building.....	26 035	\$259 539
Chemical works.....	3 156	35 203
Paper mills.....	20 011	210 880
Sugar factories.....	183	2 062
Tanneries.....	3 596	46 544
Fertilizers.....	3 668	25 559
Metallurgy.....	11 667	130 209
Other uses.....	32 546	327 741
Total.....	100 862	\$1 037 737

Production of lime in New York in 1924

KINDS	SHORT TONS	VALUE
Building.....	24 490	\$228 478
Chemical works.....	17 935	189 540
Paper mills.....	21 478	229 082
Sugar factories.....	<i>a</i>	<i>a</i>
Tanneries.....	3 405	44 784
Fertilizers.....	3 988	30 215
Metallurgy.....	10 994	121 025
Other uses.....	16 302	148 675
Total.....	98 592	\$991 799

a Included in other uses.

Production of lime in New York since 1904

YEAR	PRODUCTION IN SHORT TONS	VALUE
1904.....	494 883	\$678 225 ^a
1905.....	323 905	702 684 ^a
1906.....	313 369	795 348 ^a
1907.....	403 114	888 309 ^a
1908.....	.....	401 728
1909.....	.....	452 874
1910.....	.....	365 839
1911.....	.....	400 396
1912.....	93 176	452 002
1913.....	110 083	486 908
1914.....	82 944	370 377
1915.....	83 627	387 083
1916.....	117 490	636 668
1917.....	108 788	892 855
1918.....	87 127	913 366
1919.....	126 404	I 131 860
1920.....	92 357	I 047 261
1921.....	67 685	759 299
1922.....	96 320	957 079
1923.....	100 862	I 037 737
1924.....	98 592	991 799
Total.....		\$14 749 697

^a Includes value of lime burned by Solvay Process Company and Union Carbide Company, which in later years is reported under limestone.

Producers of limestone including lime in 1924

NAME	Albany county	ADDRESS
Hotaling Quarry Co., Inc.....	Ravena	
(C. P. Hotaling, Mgr.)		
The Callanan Road Impr. Co.....	Box 773, Albany	
<i>Cayuga county</i>		
Auburn City Quarry.....	Public Works Dep't, City Hall, Auburn	
Rock Cut Stone Co.....	531 Union Bldg., Syracuse	
Brayer Bros.	10½ Lincoln street, Auburn	
Town of Moravia	Highway Superintendent, Moravia	
<i>Clinton county</i>		
George Abdella	Plattsburg	
The Chazy Marble Lime Co.....	Chazy	
A. Florentine	126 N. Beekman street, Plattsburg	
Gebo & Bushey	Plattsburg	
<i>Dutchess county</i>		
Kelley Island Lime & Transport Co...	Cleveland, Ohio	
Spoor-Lasher Co., Inc.....	Market street, Poughkeepsie	
Carbonate Lime Corp.....	101 Park avenue, New York	
N. Y. Traprock Corp.....	101 Park avenue, New York	

NAME	<i>Erie county</i>	ADDRESS
General Crushed Stone Co.....	702 Drake Bldg., Easton, Pa.	
The Bituminous Paving Corp.....	430 E. Delevan avenue, Buffalo	
Buffalo Cement Co., Ltd.....	110 Franklin street, Buffalo	
Buffalo City Cemetery.....	Delevan avenue, Buffalo	
Buffalo Crushed Stone Co.....	1048 Ellicott square, Buffalo	
Kelley Island Lime & Transport Co...	Cleveland, Ohio	
Joseph Lang	354 Utica street, Buffalo	

Fulton county

Willard A. Kegg	Cranberry Creek
R. S. Anibal	31 Orchard street, Gloversville
Merl Haines	Mayfield

Genesee county

Genesee Stone Products Corp.....	Batavia
LeRoy Lime & Crushed Stone Corp..	R. D., Box 33, LeRoy

Greene county

General Crushed Stone Co.....	Easton, Pa.
Geo. W. Holdridge & Co.....	96 W. Bridge street, Catskill
Terry Limestone Corp.	R. D. 2, Catskill

Herkimer county

Newport Crushed Stone Co., Inc.....	Newport
Southern N. Y. Power & Ry. Corp....	Cooperstown

Jefferson county

The Adams & Duford Co.....	Chaumont
Watertown Stone Products Co.....	Watertown
The Basic Refractories Corp.....	114 N. George street, York, Pa.

Lewis county

R. W. Moren.....	5 Church street, Lowville
------------------	---------------------------

Madison county

F. E. Conley Stone Co.....	253 Union Station, Utica
Worlock Stone Co., Inc.....	R. D. 4, Canastota

Monroe county

Dolomite Products Co.....	124 Elswanger & Barry Bldg., Rochester
Britton Crushed Stone Co.....	717 C. of C. Bldg., Rochester
W. N. Britton	
Whitmore, Rauber & Vicinus.....	279 South avenue S., Rochester
Scott Bros.	31 Exchange street, Rochester

Montgomery county

Werklieren Bros.	Amsterdam
Stanley W. Olsen.....	61 Jay street, Amsterdam
Mohonk Contracting Co.....	26 River street, Amsterdam
John Olman	2 Cockrane avenue, Amsterdam
Cushing Stone Co.....	434 State street, Schenectady
H. J. Burkdorf & Son.....	R. D. 3, St Johnsville

NAME	Niagara county	ADDRESS
Wickwire Spencer Steel Corp.....	P. O. Station B, Buffalo	
F. E. Shardon.....	197 West avenue, Lockport	

Oneida county

Peerless Quarries Inc.....	45 Mann Bldg., Utica
L & M Stone Co.....	Bank place, Utica

Onondaga county

Onondaga County Quarry.....	Court House, Syracuse
Rock Cut Stone Co.....	531 Union Bldg., Syracuse
Solvay Process Co.....	Syracuse
The Britton Quarries Co., Inc.....	115 S. Salina street, Syracuse
S. F. Clough Sand & Stone Co., Inc...	1509 S. Salina street, Syracuse
Dunham Stone Co.....	114 McCarthy avenue, Syracuse

Ontario county

Geneva Stone Corp.....	Oaks Corners
------------------------	--------------

Orange county

Newburgh Crushed Stone Corp.....	Little Britain road, Newburgh
----------------------------------	-------------------------------

Rockland county

The Tompkins Cove Stone Co.....	30 Church street, New York
---------------------------------	----------------------------

St Lawrence county

Gouverneur Limestone Co.....	Gouverneur
St Lawrence State Hospital, Lewis Webb, Steward.....	Station A., Ogdensburg
Joseph McConville	27 Grove street, Ogdensburg
Ogdensburg City Quarry.....	City Clerk, Ogdensburg
Richville Limestone Co.....	Carthage

Saratoga county

Gailor Stone Co.....	285 Maple avenue, Saratoga Springs
----------------------	------------------------------------

Schoharie county

Norton Stone & Lime Co.....	Cobleskill
Mix Stone Co.....	Schoharie
Willard T. Smith.....	Sharon Springs

Seneca county

George M. Fisher.....	33 Center street, Seneca Falls
-----------------------	--------------------------------

Ulster county

H. L. Devoe	Accord
Ralph Hiller	Hurley
City of Kingston...	Kingston
State of New York.....	State Highway Dep't, Albany
New York Traprock Co., Inc.....	101 Park avenue, New York
A. J. Snyder & Co.....	Rosendale

Warren county

Finch, Pruyn & Co.....	1 Glen street, Glens Falls
Jointa Lime Co.....	Glens Falls
Queensbury Stone Co., Inc.....	Hudson Falls
The F. W. Wait Lime Co.....	Glens Falls

NAME	<i>Washington county</i>	ADDRESS
Keenan Lime Company.....	Smiths Basin	

Westchester county

New York Traprock Corp.....	101 Park avenue, New York
Carbonate of Lime Corp.....	101 Park avenue, New York
Tuckahoe Stone Co.....	Tuckahoe

Producers of marble in 1924*Clinton county*

Vermont Marble Co.....	Proctor, Vt.
Day Quarry Co.....	Plattsburg

Dutchess county

South Dover Marble Co.....	133d street & Walnut avenue, New York
----------------------------	--

St Lawrence county

Gouverneur Marble Co.....	Gouverneur
---------------------------	------------

Westchester county

Kapailo Mfg. Co.....	103 Park avenue, New York
Benedict Stone Co.....	35 West 42d street, New York City
Conlin Marble Co., Inc.....	Tuckahoe

Producers of granite in 1924*Essex county*

Keystone Green Granite Co.....	Waterbury, Vt.
Champlain Green Granite Co.....	Union State Bank Bldg., Au Sable Forks
Crown Point Spar Co., Inc.....	101 Park avenue, New York
M. L. Thomas.....	Crown Point

Herkimer county

General Crushed Stone Co.....	Easton, Pa.
-------------------------------	-------------

Jefferson county

Wisconsin Granite Co.....	105 W. Monroe street, Chicago, Ill.
William Slate	Alexandria Bay

Westchester county

Grenci & Ellis.....	Peekskill
John Brown & Sons	141st st. & Rider avenue, New York
William W. Bachman.....	White Plains

Producers of sandstone in 1924*Franklin county*

Crippen Bros.	R. D. 3, Burke
--------------------	----------------

Niagara county

C. B. Whitmore Co.....	30 Market street, Lockport
------------------------	----------------------------

Orange county

Otisville Sand & Gravel Co.....	Otisville
---------------------------------	-----------

NAME	<i>Orleans county</i>	ADDRESS
East Albion Stone Co.....	Albion	
M. A. Ryan Sandstone Quarries.....	13 Beaver street, Albion	
James L. Clark.....	Hulburton	
Thomas Monacelli	Albion	
DiLaura Stone Co.....	Albion	
Moore & Waite	Hulburton	
Aufidena Stone Co.....	Fancher	
Barney Bros.	Albion	
John J. Burns	Holley	
Thomas Vincelli	Hulburton	
Holley-Medina Stone Co.....	Holley	

Schenectady county

Schenectady Railway Co.....	512 State street, Schenectady
Webster & Springer Co., Inc.....	602 Lenox rd., Schenectady

Schoharie county

N. Y. City Board of Water Supply...	Municipal Bldg., New York
-------------------------------------	---------------------------

Tompkins county

Superintendent of Buildings & Grounds	
C. E. Curtis, Sup't.....	Cornell University, Ithaca

Producers of bluestone in 1924*Broome county*

D. G. Underwood.....	Deposit
----------------------	---------

Chenango county

Clarke-Conroy Co.....	Miller Block, Norwich
O. Graham & W. A. Aylesworth.....	Oxford

Delaware county

Herbert Shaw	167 Clinton avenue, Kingston
Henry Prigge	550 Liberty avenue, Jersey City, N. J.
Harold A. Schneider.....	East Branch
Johnston & Rhodes Bluestone Co.....	East Branch
William P. Schneider.....	Horton
Kenney Bros.	Long Eddy
J. E. Goodsir.....	Sidney

Schoharie county

Jos. E. Wands.....	Esperance
--------------------	-----------

Steuben county

Corning Stone Co.	Corning
------------------------	---------

Ulster county

Catskill Mountain Blue Stone & Piling Corp.	Saugerties
John Maxwell & Son.....	Saugerties
E. E. Molyneaux	Pine Hill

NAME	<i>Wyoming county</i>	ADDRESS
Portageville Bluestone Co.....		Olean
American Bluestone Company.....		Portageville

Producers of trap in 1924*Rockland county*

Belmont-Gurnee Stone Co., Inc..... North Bergen, N. J.

Producers of miscellaneous stone in 1924

New York Central R. R. Co..... New York

Niagara county

Niagara County Lockport

Queens county

Emmet S. Simpson..... Queens

References**Colony, R. J.**

1919 High-Grade Silica Materials for Glass, Refractories and Abrasives. N. Y. State Mus. Bul. 203-4, p. 1-31.

Dickinson, H. T.

1903 Quarries of Bluestone and other Sandstones in New York. N. Y. State Mus. Bul. 61, p. 1-114

Eckel, E. C.

1902 The Quarry Industry of Southeastern New York. N. Y. State Geol. 20th Ann. Rep't, p. 1141-1176

Merrill, George P. & others.

1884 The Building Stones of the United States. Report of the 10th Census, v. 10, p. 1-393

Newland, D. H.

1916 The Quarry Materials of New York—Granite, Gneiss, Trap and Marble. N. Y. State Mus. Bul. 181, p. 1-212

1921 Stone. The Mineral Resources of the State of New York. N. Y. State Mus. Bul. 223-24, p. 247-81.

Smock, John C.

1888 Building Stone in the State of New York. N. Y. State Mus. Bul. 3, p. 1-154

1890 Building Stone in New York. N. Y. State Mus. Bul. 10, p. 1-210

TALC

The mining of talc is confined to the counties of St Lawrence and Lewis. The Gouverneur district of St Lawrence county lies to the east and southeast of Gouverneur in the towns of Edwards and Fowler. Here in a narrow belt of Precambrian limestones extending through the village of Edwards and to the southwest as far as Sylvia lake, are located important talc deposits and mines.

A second belt of talc deposits is parallel to the one heretofore mentioned and lies a few miles to the south. This second belt extends into Lewis county where talc mining was started in 1911 near Natural Bridge.

Production

In 1923,¹ New York produced 36 per cent of the total tonnage of talc mined in the United States. Other producing states with an output of more than 4 per cent of the total, were Vermont, 34 per cent; Virginia, 14 per cent; and California, 8 per cent. In general, it may be said that New York and Vermont together produce 70 to 75 per cent of the talc output for the United States.

Altogether there are ten states producing talc. The talc produced in the eastern states is associated with somewhat irregular belts of crystalline rocks extending from New York and Vermont through the Atlantic states into Georgia. California is the only talc-producing state in the West.

Production of talc in New York since 1919

YEAR	SHORT TONS	VALUE
1919.....	62 495	\$750 765
1920.....	68 168	977 228
1921.....	37 489	464 645
1922.....	71 470	1 116 914
1923.....	71 304	1 079 322
1924.....	78 340	1 162 488
Total.....	389 266	\$5 551 362

Production of talc in New York over a 20-year period has totaled 1,324,147 short tons with a value of \$13,714,302. During the first ten years of the 20-year period production totaled nearly half the tonnage, with an average of about 63,000 short tons a year. In the second ten-year period a gain in tonnage of about 10 per cent was made, with an average of about 69,000 tons a year. The average price a ton, on the other hand, for the first ten-year period was \$8.45; for the second ten-year period, \$12.08, or a price increase of more than 40 per cent.

During the whole 20-year period, from 1904 to 1923, production has averaged better than 66,000 short tons a year. In 1919 the output was 62,495, somewhat below the average; in 1920, 68,168, slightly above. Then came a year of general depression, in the course of which tonnage dropped to the lowest point of that 20-year period—in fact, the lowest it had been in 28 years—37,489 short tons. This drop in

¹ Since the above was written, the 1924 production of talc has been compiled. Tonnage and value are given in table of production.

tonnage was comparable to that which occurred at the same time in Vermont and in fact all over the country. In 1922, however, tonnage for New York rebounded to 71,470 short tons, a 91 per cent increase over the previous year, while its value increased 140 per cent over the value of the 1921 tonnage. In Vermont for the same year, tonnage made a recovery with 55 per cent increase in quantity and only 49 per cent increase in value. In 1923 production and price remained fairly constant with those of 1922—71,304 short tons and a value of \$1,079,332, as against 71,470 short tons in 1922 with a value of \$1,116,914. Advance totals for 1924 indicate still further improvement both in tonnage and value—tonnage reaching 78,340 short tons with a value of \$1,162,488. Except for the year 1916, this is the highest tonnage ever attained. Without exception, its value is higher than ever before. It is interesting to note that the value of talc for the three years, 1922, 1923 and 1924, approaches one-fourth the total value of the industry in 20 years previous to 1924.

For the five-year period from 1914 to 1919 production totaled 382,663 short tons and value \$3,993,001, with an average selling price of \$10.43 a ton. From 1919 to 1923, which included the reduced production of the year 1921, production totaled 310,926, with a total value of \$4,388,874. The average selling price of \$14.11 was more than twice that of 1904. The highest average selling price was \$15.62 for the year 1922. This was closely rivalled by that of 1923, which was \$15.13.

Altogether the output of talc in the State up to 1924 has amounted to about 2,500,000 tons valued at \$21,500,000. Shipments began to assume importance about 1880, but talc was mined on a small scale before that date, which, however, marks the inauguration of continuous operations in the Edwards district.

At present three firms are engaged in the production of talc in New York: the Carbola Chemical Co., C. J. Zimmerman, president, 299 Ely avenue, Long Island City; the International Pulp Co., Michael Doyle, president, 41 Park row, New York; and the W. H. Loomis Talc Corp., W. H. Loomis, president, Gouverneur. The first of the above companies operates in Lewis county, the other two in St Lawrence county.

References

Brinsmade, Robert E.

1905 Talc in Northern New York. *The Eng. & Min. Jour.*, Dec. 23, 1905, p. 1155-57

Cushing, H. P. & Newland, D. H.

1925 Geology of the Gouverneur Quadrangle. *N. Y. State Mus. Bul.* 259, p. 109-16

Diller, J. S.

1912 Talc and Soapstone. Mineral Resources of the United States,
Part 2, p. 1133-60

Nevius, J. Nelson

1899 Talc Industry of St Lawrence County, New York. N. Y. State
Mus. Rep't 51, v. 1, p. 1119-1127

Newland, D. H.

1921 Talc. The Mineral Resources of the State of New York. N. Y.
State Mus. Bul. 223-24, p. 283-95

Smyth, C. H. jr

1896 The Genesis of the Talc Deposits of St Lawrence County, N. Y.
School of Mines Quarterly, (Columbia University), v. 17, July,
1896, p. 283-95

ZINC

The zinc ore mined in New York is known as sphalerite (ZnS), or zinc blende. This mineral is also known simply as blende and blackjack. Pure ore contains 67 per cent zinc.

The two regions in New York where zinc has been found in sufficient quantities to be mined are rather remote from each other, and the zinc ores in the two regions occur in rocks differing greatly in geologic age.

In the older rocks of Precambrian age in St Lawrence county are found the zinc ores of the Edwards district, whereas the zinc deposits of the Shawangunk range, which extends from Ulster county southwest into New Jersey, is of Silurian age. Although zinc ores were known to exist in the Edwards district in 1835, it was not until about 1903 that serious prospecting was undertaken, which finally resulted in active mining and shipments in 1915. Since that time operations have been carried on continuously.

Practically all the zinc ore produced in the Edwards district has been taken from the mine of the Northern Ore Company of Edwards. (Since 1924 this mine has been operated by the New York Zinc Co., Inc., Edwards.) In addition to the deposits of ore being worked near Edwards, a dozen or more prospects have been found between this place and Sylvia lake ten miles to the southwest. Of these prospects only one has been developed to the proportions of a mine. This is the Hyatt mine southwest of Talcville. Here some operations were carried on between the years 1918-22, at which time workings had been carried to a depth of 425 feet.

In the Shawangunk mountain region some of the deposits containing zinc were rather extensively worked between 1830 and 1840. In the early operations the main mineral sought was galena, which is found associated with the sphalerite. The latter mineral is, however, the more abundant. Other metallic minerals present in small amounts include chalcopyrite and silver. The main deposits of the ores are

within fracture zones of the Shawangunk grit and conglomerate, and here the ores are found in fissures, brecciated veins, and along bedding planes. None of the zinc-bearing ores of the region have been mined for a number of years, but one of the mines operated during 1918 produced a few tons of lead together with some silver.

The Ellenville mine is the most northerly of the Shawangunk district and was first opened about 1820. Mining operations have been carried on at various times during the past 100 years. In 1840 the mine was operated by the North American Coal and Mining Co. The period of greatest activity was during 1853-57, when the mine was operated by the Ulster Company. About 1904-5 a milling plant was erected at the mine and operations were carried on for a short time by the Ellenville Zinc Co. The last activity at the mine was in 1917 when the shaft was unwatered and some prospecting done by the Empire State Zinc Co. A tunnel a short distance north of the above described mine was driven many years ago. It is in a fracture zone in which considerable water is found. For a number of years the water from within this tunnel was utilized by the Sun Ray Spring Co. for a table water. The mine at Ellenville has long been of interest to mineralogists and here have been obtained many beautiful groups of quartz crystals.

The mine near Summitville, Sullivan county, was originally known as the Shawangunk deposit, and was extensively worked during the period 1830-40. A somewhat detailed account of the operations during the period is given by Mather who states that the lead ore was treated in a local smelter. The ore consists of the sulphides of zinc, lead, copper and iron. A little silver is also present and at times has been recovered. The mine was last worked by the St Nicholas Zinc Co. in 1918. The ore was brought down to the mill by an aerial tramway 1600 feet long. Zinc, lead and the small amount of silver present were recovered.

The Guymard mine is just north of the Erie Railroad station at Guymard. The deposit is said to have been discovered in 1862 and active operations were carried on by the Guymard Lead and Zinc Co. from 1863 to 1870. The ore was shipped to Newark, N. J., for smelting and the zinc was utilized in the manufacture of zinc oxide. Altogether the output for the above period of zinc and lead ore amounted to about 10,000 tons. The mine was closed in 1870 and except for a brief active period during the '80's no further production has been reported. In 1917 the mine was partly unwatered with a view of resuming mining operations, but this activity did not result in the mining of any ore.

Near Otisville, a few miles north of Guymard, is a mine that was once worked by the Washington Mining Co. No details of the mining operations are available. Some prospecting was done at this mine during 1906-7 by the Phoenix Lead Co., Paterson, N. J., but the operations did not reach the production stage.

Production of zinc in New York since 1915

YEAR	ZINC ORE IN SHORT TONS	ZINC IN SHORT TONS	VALUE
1915.....	14 398	2 455	\$649 593
1916.....	40 800	4 507	1 154 152
1917.....	47 961	5 192	1 059 186
1918.....	40 850	3 776	687 230
1919.....	51 411	5 120	747 666
1920.....	53 780	5 654	915 948
1921.....	39 940	1 572	157 200
1922.....	53 400	4 816 ^a	549 024
1923.....	63 660	8 463	1 150 968
1924.....	40 350	4 664	606 320
Total.....	446 550	46 219	\$7 677 287

^a Includes some zinc from ore treated in 1921.

A deposit of these ores is also found near Spring Glen and described by Mather as "situated on the Shawangunk mountain about one mile east of Redbridge, and six or seven miles from Wurtsboro; at an elevation of 600 or 700 feet above the valley." Redbridge does not appear on the present-day maps, but according to Mather's section, which is drawn to scale, the place is three miles southwest of Ellenville as shown on the line of section.

In addition to the two zinc districts previously mentioned, a number of occurrences of sphalerite in small veins or cavities have been recorded from the Paleozoic limestones of the State. These localities include: the Beekmantown and Trenton limestones at many places bordering the Adirondacks; just west of Saratoga Springs in an old limestone quarry; near Salisbury Corners, Herkimer county; at Martinsburg, Lewis county, associated with galena and pyrite; two miles south of Sprakers Basin, Montgomery county, associated with galena; in the Lockport and Clinton limestones of western New York in and near the city of Rochester and at Lockport.

References

Emmons, Ebenezer

1838 N. Y. Assembly Doc. No. 200, p. 213

1842 Geology of New York. Report on Second District, p. 354-60

Mather, W. W.

1843 Geology of New York. Report on the First District, p. 358-62

McDonald, P. B.

1913 Zinc Mining In New York. Eng. & Min. Jour., v. 95, Feb. 15, 1913, p. 362

Newland, D. H.

1916 The New Zinc Mining District near Edwards, N. Y. Economic Geology, v. 11, Oct.-Nov. 1916, p. 623-44

1917 The Zinc-Pyrite Deposits of the Edwards District, New York. N. Y. State Defense Council Bul. 2, Nov. 1917, p. 1-72

1921 Zinc. New York State Museum Bul. 223-24, p. 296-307

Smyth, C. H. jr

1917 Genesis of the Zinc Ores of the Edwards District, St Lawrence County, N. Y. N. Y. State Mus. Bul. 201, p. 1-32

INDEX

- Basalt, *see* Trap
 Bluestone, producers, 93
 Brick, 6, 10-15, 19; manufacturers, 26-28
 Brizment, 18
 Building brick, *see* Brick
 Building tile, 21; manufacturers, 29
- Carbon dioxide, 9, 12-15, 16
 Cement, 6, 16
 Census, Bureau of, acknowledgment to, 9
 Ceramic mosaic, manufacturer, 29
 Clay materials, 18; manufacturers, 26-31; references, 31
 Clay products, 6, 10-15; manufacturers, 30
 Crude clay, 9, 10-15, 32
- Diatomaceous earth, 9, 10-15, 33; references, 34
 Drain tile, 21; manufacturers, 29
- Earthenware, manufacturers, 30
 Emery, 9, 10-15, 34; analyses, 35; producers, 36; references, 36
- Face brick, 21; manufacturers, 28
 Feldspar, 9, 10-15, 36; producers, 38; references, 38
 Fire brick, 21; manufacturers, 30
 Fuller's earth, 38
- Galena, 51
 Garnet, 6, 10-15, 39; producers, 41; references, 42
 Gas wells, *see* Natural Gas
 Gasoline, recovered from natural gas, 9, 10-15, 63; producers, 64
 Gems, 11
 Granite, 8, 10-15, 82; producers, 92
 Graphite, 10-13, 42; references, 43
 Gravel, 8, 10-15, 77; references, 77
 Gypsum, 6, 10-15, 44; producers, 47; references, 47
- Hematite, 48, 49; producers, 50
 Hotel china, manufacturers, 30
- Iron ore, 7, 10-15, 47; producers, 48, 50; references, 50
- Lead, 51; references, 52
 Lime, 86
 Limestone, 8, 10-15, 82; producers, 89-92
 Limonite, 47
- Magnetite, 48; producers, 49, 50
 Marble, 8, 10-15, 82; producers, 92
 Marl, 9, 11-15, 52; producer, 54; references, 54
 Metallic paint, 10-15
 Mica, 11, 14, 54
 Millstones, 9, 10-15, 55; producers, 57
 Mineral paint, 57
 Mineral production, value, 5; annual, table, 9
 Mineral waters, 7, 10-15, 58; producers, 59; references, 61
 Miscellaneous stone, *see* Stone
 Molding sand, 8, 10-15
- Natural cement, 6, 9, 11-15, 17; producers, 18; references, 18
 Natural gas, 7, 10-15, 61; references, 62
 Natural gas gasoline, 9, 10-15, 63; producers, 64
- Oil pools, *see* Petroleum
- Paint, 57
 Paving brick, 21; manufacturers, 28
 Peat, 9, 10-15, 65; producers, 67; references, 67
 Petroleum, 7, 10-15, 67; references, 70
 Porcelain electrical supplies, 22; manufacturers, 31
 Portland cement, 6, 10-15, 16; producers, 17

- Potash, 10-12
- Pottery, 6, 10-15, 22; manufacturers, 31
- Pyrite, 9, 10-15, 70; producers, 71; references, 71
- Quartz, 9, 10-15, 72; producers, 72; references, 72
- Refractory cement, 22; manufacturer, 30
- Roofing slate, 8, 81
- Saggers, manufacturers, 31
- Salt, 7, 10-15, 72; producers, 76; references, 76
- Salt wells, location, 73
- Sand, 8, 10-15, 77; references, 77
- Sand-lime brick, 9, 10-15, 79
- Sandstone, 8, 10-15, 82, 83; producers, 92
- Sanitary ware, manufacturer, 30
- Sewer pipe, 6, 21; manufacturer, 29
- Silica, 72
- Slate, 8, 10-15, 80; producers, 81; references, 81
- Slip clay, 32; analyses, 33
- Stone, 8, 10-15, 82; producers, 94; references, 94
- Stove lining, 21; manufacturers, 29
- Tables, annual mineral production, 9; Portland cement, 16; clay materials, 19; common building brick, 20, 22-25; crude clay, 32; feldspar and quartz, 38; garnet, 41; graphite, 43; gypsum, 45; iron ore, 48; millstones, 56; mineral water, 59; natural gas, 62; natural gas gasoline, 64; petroleum, 68; pyrite, 71; salt, 74-75; sand and gravel, 78; molding sand, 79; sand-lime brick, 80; slate, 81; stone, 84-86; lime, 87-89; talc, 95; zinc, 99
- Talc, 8, 10-15, 94; producers, 96; references, 96
- Terra cotta, 6, 21; manufacturers, 29
- Tile, 6, 21; manufacturers, 29
- Trap, 8, 10-15, 82, 84; producers, 94
- United States Geological Survey, acknowledgment to, 9
- Zinc, 8, 10-15, 97; references, 100